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CONTENTS.

On the Study of Anthropology. By Dr. James Hunt, F.S.A., President A.S.L.

Wild Men and Beast Children. By E. Burnet Tylor, F.A.S.L.

On the Tribes of Loreto in Northern Peru. By Prof. Raimondi. Translated from the Spanish by William Bollaert, F.A.S.L.

A Day with the Fans. By Capt. R. F. Burton, H.M. Consul at Fernando Po, and V.P.A.S.L.

On the Difference between Man and the Lower Animals. By Theodor Bischoff. Translated from the German.

Summary of the Evidence of the Antiquity of Man. By Dr. James Hunt.

Huxley on Man's Place in Nature.

Jackson on Ethnology and Phrenology.

Lyell on the Geological Evidence of the Antiquity of Man.

Wilson's Pre-historic Man.

Pauly's Ethnographical Account of the Peoples of Russia.

Commixture of the Races of Man. By John Crawfurd, Esq., F.R.S.

Burton's Prairie Traveller.

Owen on the Limbs of the Gorilla.

Man and Beast. By Anthropos (C. Carter Blake).

Dunn's Medical Psychology.

Human Remains from Moulin-Quignon. By A. Tylor, Esq., F.G.S. (*With an Illustration.*)

Notes of a case of Microcephaly. By R. T. Gore, Esq., F.A.S.L.

Notes on Sir C. Lyell's Antiquity of Man. By John Crawfurd, Esq., F.R.S.

Falconer on the reputed Fossil Man of Abbeville.

Miscellanea Anthropologica.

Journal of the Anthropological Society of London

On the Science of Language. By R. S. Charnock, Esq., F.S.A., F.A.S.L.

Fergusson on the Influence of Race on Art.

On the Creation of Man and Substance of the Mind. By Prof. Rudolph Wagner.

Pictet on the Aryan Race.

Ethnological Inquiries and Observations. By the late Robert Knox, M.D.

On the Application of the Anatomical Method to the Discrimination of Species. By the same.

On the Deformations of the Human Cranium, supposed to be produced by Mechanical Means. By the same.

History of the Proceedings of the Anthropological Society of Paris. By M. Paul Broca, Secretary-General.

On the supposed increasing Prevalence of Dark Hair in England. By John Beddoe, M.D., F.A.S.L.

The Abbeville Fossil Jaw. By M. A. de Quatrefages. Translated by G. F. Rolph, Esq.

Miscellanea Anthropologica.

On Cerebral Physiology.

Seemann on the Inhabitants of the Fiji Island
By A. A. Fraser, Esq., F.A.S.L.

The relation of Man to the Inferior Forms
Animal Life. By Charles S. Wake, Es
F.A.S.L.

Proceedings of Anthropological Society of Pa

Anthropology at the British Association:—D
Hunt on Anthropological Classification; M
Carter Blake on South American Cranioscop
Dr. Hunt on the Negro; Mr. W. Turner
Cranial Deformities; Mr. Duckworth on th
Human Cranium from Amiens; Prof. King
the Neanderthal Skull; Dr. Embleton on th
Anatomy of a young Chimpanzee; Mr. Carte
Blake on Syndactyly; Mr. Roberts and Pro
Busk on a Cist; Mr. Crawfurd on the Co
mixture of Man; Dr. Camps on Troops
India; Dr. Murray on Instinctive Actions
Mr. Samuelson on Life in the Atmosphere
Mr. Glaisher on the Influence of High Alti
tudes on Man; Mr. Hall on the Social Life
the Celts; Mr. Petrie on the Antiquities of th
Orkneys; Lord Lovaine on Lacustrian Huma
Habitations; Professor Beete Jukes on certai
Markings on the Horns of Megaceros Hiber-
nicus; Mr. Crawfurd on Sir C. Lyell's Anti-
quity of Man; Prof. Phillips on the Antiquit
of Man; Mr. Godwin-Austen on the Alluvia
Accumulation in the Valleys of the Somme a
Ouse; Mr. Wallace on Man in the Mala
Archipelago; Mutu Coomara Swamy on th
Ethnology of Ceylon; Mr. Crawfurd on th
Origin of the Gypsies; Mr. Crawfurd on th
Celtic Languages; Mr. Charnock on Celti
Languages; Personal Recriminations in Sec-
tion D; Concluding Remarks.

Waitz's Introduction to Anthropology.

Kingsley's Water Babies.

Lunacy and Phrenology. By C. Carter Blake
Esq., F.G.S., F.A.S.L.

The Rival Races; or, the Sons of Joel.

Ramsay on Geology and Anthropology.

Baruch Spinoza.

Anthropology in the Nursery.

Miscellanea Anthropologica.

JOURNAL OF THE ANTHROPOLOGICAL SOCIETY
Tylor on Human Remains from Moulin-
Quignon; Schvarez on Permanence of Type
Wake on Man and the Lower Animals; Bol-
laert on Populations of the New World; Mar-
shall on Microcephaly; Busk on Human Re-
mains from Chatham; Bendyshe on Anglo-
Saxon Remains from Barrington; Charnoc
on Science of Language; W. Reade on Bus
Tribes of Equatorial Africa; General Meetin
of the Society; Carter Blake on Antiquity o
the Human Race.

LONDON: TRÜBNER & CO., PATERNOSTER ROW.

Notes on the Economy of certain Micro-Lepidoptera.
By Mr. Charles Healy.

1. *Larva of Adela Degeerella.*—This larva is reported to feed on the Anemone nemorosa (wood anemone); whether it does so at any period of its larval state I am unable to say, but in March, 1861, I found several of the larvæ, being the first, I believe, ever discovered in this country, and in the following May bred two of the perfect insects, both females. These larvæ were found amongst the fallen leaves at the base of birch-bushes, and fed on the decayed leaves until the following April, when I offered them the buds of beech and hazel, which they appeared very partial to, each larva attacking a bud at its base, and eating out the interior. As I believe nothing at present is known as to the economy of the very young larva, I am inclined to think that a careful examination, at the end of June and the beginning of July, of the plants and bushes, particularly beech, in the locality frequented by the imago, might lead to its detection. Possibly the larva in its earlier stages of existence, like that of Incurvaria muscalella, mines its food, blotching the leaf, and afterwards cuts out a small case and descends to the ground: any blotched leaves found in the metropolis of the imago containing minute larvæ should be collected, and the result carefully noted, as we have several interesting observations to make on the habits and economy of this larva before its history can be considered as thoroughly mastered. The following fact came under my own notice:—Three of the full-fed larvæ that I had placed on some mould in a jar, a day or so afterwards suddenly disappeared: feeling convinced they could not have escaped from the jar, I gently turned over the mould, and found one larva just under the surface, another about the centre, whilst the third larva I found had penetrated to the bottom of the jar. Can this be its usual habit?

2. *Economy and Moulting of the Larva of Incurvaria muscalella.*—It sometimes happens when looking for one larva that we find another equally, if not more, acceptable to us than that for which we were searching. Just such an occurrence, on the 7th of June, 1863, revealed to me the inner life and economy of the very young larva of this species; for whilst engaged searching a hedge, consisting of sloe and whitethorn, I became aware of the presence of numbers of small blotches in the leaves, each blotch containing a minute larva: feeling interested as to what they would eventually prove to be the larvæ of,

I brought home some half-dozen for attentive observation and study. On the 8th I noticed that each larva had cut out an *entire* case of the upper and under cuticle of the blotch in which it had been feeding: this is sometimes done so adroitly that the whole of the mined portion of the leaf is appropriated by the larva in the construction of its first case. The blotches, as far as I have yet observed, are always near the edge of the leaf. On the 10th I took the following description of the larva:—Body white; head shining dark brown; back of the second and third segments brown; no appearance of a dorsal vessel. On the 16th it commenced enlarging its case; it then merely cut off sufficient of the leaf to act as a cover for *one side* only, and not, as on the 8th, cutting out an entire case. On the 17th, the larva's body was dirty white; back of the three first segments dark brown, the first segment having a few bristles projecting from its sides; dorsal vessel darkish. On the 19th it made a further enlargement of its case: I must here observe that every addition to the case is a trifle larger, and overlaps that previously made. I was much interested in watching the method adopted by the larva in making additions to its case: having chosen a part of the leaf suitable for its purpose, the larva fastens a silken cord to the leaf and its case, so as to keep the latter in its position; then stretching out its body, it gnaws through the leaf, a short distance beyond where the silken cord is fastened; after cutting the leaf for a short distance it fastens another silken cord to the leaf, and so on alternately fastening cords and cutting the leaf until the required addition to its case is completed. Not the least interesting feature in the habits of the larva is the change of taste evinced by it for oak, in preference to the sloe and whitethorn, on which it feeds at the earliest stage of its existence; this predilection it evinces in a marked manner, feeding with evident relish on the green leaves, and appropriating portions of its favourite food in constructing its case. I have only as yet observed one moult, the covering of the head being thrown off from the front, the skin retiring down the larva's body, and is then finally ejected from the case.

3. *The Larva of Solenobia inconspicuella carnivorous.*—I have ascertained for a fact that this larva has a slightly carnivorous taste, for on placing a dead Musca domestica into a jar along with several of these larvæ, on looking at the fly, after an interval of four days, I observed that its legs, wings and eyes were entirely consumed, and the larvæ were then engaged feeding on the abdomen, a portion of which had been eaten. The female of this species, like that of Talæporia pseudobombycella, Psyche roboricolella, &c., lays its eggs inside its

case, and covers them with *down*, which is used by the young larvæ in constructing their first cases.

4. *As to the Moulting of the Larvæ of the Genus Lithocolletis.*—At page 125 of the ninth volume of the 'Entomologist's Weekly Intelligencer,' there is an article, written by Mr. Scott, entitled "Curiosity," in which that gentleman asks the following question, "Do the larvæ of Lithocolletis moult as other larvæ with which we are acquainted do? if so, what becomes of the cast-off skins?" Now, from close inspection of the mines of the following species, namely, Lithocolletis pomifoliella, L. corylella, L. spinicolella, L. Faginella, L. carpinicolella, L. tenella, L. sylvella, L. Emberizæpennella, L. Schreberella, L. trifasciella, L. Massaniella, and various oak-feeders, I can answer that they do moult, not only once, but twice: a careful search amongst the "frass" in the larva's mine will disclose the presence of two cast-off skins concealed therein.

CHARLES HEALY.

74, Napier Street, Hoxton, N.

Life-Histories of Sawflies. Translated from the Dutch of M. Snellen van Vollenhoven, by J. W. MAY, Esq.

(Continued from page 8792).

ATHALIA SPINARUM, *F.*

Fabr. Syst. Piez. p. 26, f. 21. *Panzer, Fauna Germ.* 59, f. 18. Athalia centifoliæ, *Hartig, Blatt-und Holzwespen*, p. 284, No. 1. *Lepel., Monogr.* p. 24, No. 71. *Menzel, Ueber den Afterraupenfrass der Weissrübenblattwespe* (no date or publisher's name). *J. Curtis, Farm Insects*, p. 37 *et seq.*

Athalia rufo-flava, capite cum antennis, excepto ore, mesothoracis dorso, tibiarum tarsorumque apicibus nigris.

The first four of the above authors have confined themselves to the description, and, in the case of Panzer, to the representation of the imago; the two following have, in addition, given some account of the damage done by the larva to the turnip crop. Now although the history of this sawfly may be said to be sufficiently investigated and made known, especially since the appearance of Curtis's book, we could not pass over this insect in a description of our native Tenthredonidæ, *first*, because we propose, if possible, to take in hand all the indigenous species of the family; and, *secondly,* because Menzel's *brochure* and the work of Curtis are as yet very little known.*

Mr. Menzel states that in 1842 and 1853 this sawfly proved very destructive in the Swiss Canton of Zurich; in the first-named year its effects were confined to the immediate neighbourhood of the town of Zurich, but in September of the latter year the insect had extended its ravages throughout the canton. M. Cornelius, writing from Elberfeld at the end of October, 1858, stated that the larva of this sawfly was to be met with in immense numbers on the turnip-plant, not only in the neighbourhood of his place of residence, but also in the Moselle district, and, as he supposed, had extended its ravages through the whole of Rhenish Prussia. He adds, that four years previously the injury caused by the insect had been noticed, although to a much less extent.

We have taken the following respecting the ravages of Athalia spinarum in our own country, from the 'Journal of Agriculture' of Dr. J. Wttewaall.

Before the year 1854 the larva does not appear to have caused any such damage to the turnip crop as to have been considered worthy of notice in the public papers or any scientific publication; its ravages were first observed by my friend Wttewaall himself on his own summer turnips. It was also stated by M. Havelaar, of Ellekom, that as early as 1833 the injury caused by this insect to his turnip crops had attracted his attention, and that in the above-mentioned year, 1854, his whole crop of that vegetable was destroyed by Athalia spinarum. He had at the same time observed that the larva always, or so long as possible, eats holes in the leaves, so that it very rarely feeds with its body sidewise, only doing so when all the substance of the leaf between the veins has been consumed; for this reason he calls in question the accuracy of the figure given by Nordlinger at page 409 of 'Die Kleine Feinde der Landwirthschaft.'

In the following year, 1855, the larva was more widely spread, and appeared in the turnip-fields in increased numbers, so that notices were received from various parts of the country respecting the injury it was causing. The editor of the 'Landbouw Courant' ('Journal of Agriculture') was informed that its ravages had been observed on the summer crop at Heelsum, on the autumn crop at Voorst and Heerde, also at Dedemsvaart and in North Brabant in the neighbourhood of Moergestel, Bois le Duc and Langstraat.

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* The above observation is of course applied, in the original, to Dutch readers; but as most English naturalists may be supposed to be acquainted with the 'Farm Insects' of Curtis, I have, with the permission of the author, omitted that part of the present paper in which he recapitulates the main facts contained in Mr. Curtis's book respecting the ravages caused by this sawfly in Great Britain.—*J. W. M.*

In 1857 the larva was again observed to cause considerable injury in the country about Ellekom, Heelsum, Dodewaart, Hattem, Deventer and Voorst. Dr. Wttewaall wrote in October of that year, "We think that Athalia spinarum will appear in great numbers next year, and, unless kept down by the wet weather, be the cause of great loss."

Nevertheless it appears that 1858 passed over without the usual turnip harvest having suffered much, so that the weather must have exercised some influence on the larva of our sawfly.

I am also unacquainted with any record of its ravages in 1859.

If the names of the villages and towns mentioned in these returns are noted, it will be seen that the western part of our country appears to have been hitherto free from these attacks, and we thus come to the conclusion that it is most improbable that the fly should ever have flown over in great numbers from this country to England. We will now pass on to a description of the different states in which this insect is found; in other words, of its metamorphoses.

The egg is laid in a leaf of a turnip plant (*Sinapis arvensis* or *Raphanus Raphanistrum*) in an incision made by the saw of the female in the epidermis of the leaf. It is oval, white and subtransparent, and is always deposited near the margin of the leaf. At *a a*, fig. 1, pl. 9, is represented the position of two eggs on a turnip-leaf. In five days, or perhaps in a shorter time, if the weather is very favourable for their development, the young larvæ make their appearance; should the weather be very damp and cold, they are longer before they are hatched. On their first emerging from the egg the little larvæ are colourless and nearly transparent, with the exception of two little spots on the head; however, they very soon assume a pale green colour. A short time afterwards they begin to feed, eating several little holes in the leaf. Six or seven days afterwards they change their skin for the first time, when most of them are black or a very deep green. According to Curtis ('Farm Insects,' p. 48) they moult four times.

After the third moult they have acquired the size of fig. 2. The appearance of the larva is then as follows:—The head is narrower than the body, shining, black and beset with a few very short stiff hairs; the eyes are placed in circular rings; beneath the eyes are two palpiform organs composed of six very short joints. The body is cylindrical, and consists of twelve segments, each of these being subdivided into several folds. It is quite bare, having no pubescence on any part. The upper surface, as far as the spiracles, is black or deep blackish green; then follows on either side a longitudinal slate-coloured stripe; then a row of black, mostly double, oblong spots; the legs, together with the ventral surface, are all slate-colour. There are twenty-two legs; namely, three pairs of horny thoracic legs, black marbled with gray, seven pairs of gray abdominal legs, and a pair of anal prolegs, so that the fourth segment only is destitute of organs of progression.

Many of my larvæ after their last moult assumed a much paler dull gray tint, as represented at fig. 4 of our plate. The head is black, and the gray near the head somewhat darker than on the middle of the back. These larvæ were a little smaller than the black ones.

On comparing our figure with that of Curtis, in plate B of 'Farm Insects,' a considerable difference will be perceived. His larvæ are more or less brown on the dorsal surface and yellowish on the sides; however, we can assure our readers that our drawings were made from life, and we must therefore suppose that Mr. Curtis, usually so accurate, or at all events the artist who coloured his plates, has been mistaken in this instance, for in the description the colour of the back is given as slate or gray, and that of the sides is called a pale line.

These larvæ repose somewhat curled up on the upper surface of the leaves, and, in contrast with the habits of some other sawfly larvæ, appear to luxuriate in the hottest sunshine. They mostly eat holes in the leaves, feeding, however, sometimes along the margins, to which they generally keep themselves attached by the six thoracic legs. When feeding they slightly elevate the abdomen.

According to the views of Mr. Wttewaall, there must be three generations of this insect in the year in this country; the first living as larvæ in May and June on the wild radish and wild mustard; the second in July and August, subsisting on the summer turnip crop; and the third in September and October on the autumn crop. Nevertheless it is most probable that very many individuals of the second and third generations will be found on wild plants of the rape family.

When full grown the larva descends to the ground, and, burrowing one or two inches below the surface, makes a little oval cocoon of grains of earth, as represented at plate 9, fig. 5; this it lines with a white satiny material, so that the walls inside are quite smooth and shining. In this receptacle it changes to a white pupa (fig. 6). The pupa gradually acquires a gray tint, and the eyes become black; at last all the colours of the imago begin to make their appearance.

The first brood, and, if a third is to follow, the second require but a short time, two or three weeks being sufficient, to pass from the larval through the pupa state, and to appear as the perfect insect, but the last brood remains shut up in the pupa-case all through the winter, at least up to the end of March, sometimes till April or even into May. With me Athalia spinarum once made its appearance on or just before the 29th of March, and on another occasion not until the 26th of May: I am quite unable to account for this difference.

This insect and Athalia Rosæ, *L.*, are the only representatives occurring in this country of the genus Athalia, which appears, moreover, to be not very rich in species; its characteristics are as follows:—Sawflies having antennæ of from ten to eleven joints, becoming somewhat thicker towards the end; anterior wings with two marginal and four submarginal cells; the recurrent nervures joining the second and third submarginal; the anterior portion of the anal cell obliquely divided; the posterior wings with two middle cells.

The perfect insect may be described as follows:—The female is generally 8 centimetres long, expanding to 17 centimetres; the male usually not more than 6 centimetres, and is, more especially as regards the abdomen, much more attenuated. The general colour of the body is a clear orange or deep yellow. The head, seen from above, is broad quadrangular, the angles rounded, viewed from the front more triangular, black with a gray silky pubescence, more especially above and below the trophi. The antennæ have ten joints in the male and eleven in the female, and are more or less clavate; that is to say, they become broader towards the end. They are black on the upper surface, the last joint (and in the female the first also) being likewise of that colour, the middle ones being pale gray or even white; in the male the first two joints of the antennæ are mostly white or yellow on the under surface and at the sides. The last two joints have evidently proceeded from the division of the normal terminal joint (it must be remembered that the large family of Tenthredo, *Klug*, of which Athalia of Leach is really but a section, has nine joints in the antennæ). The parts of the mouth are white or very pale yellow. The upper lip (fig. 8 *a*) is broadly quadrate, the anterior angles truncate; the mandibles or upper jaws are triangular, having at the end, which is curved, a chestnut-brown hook, and below this on the inner side a rounded tooth (fig. 8 *b*); the lower jaws or maxillæ consist of two lobes (fig. 8 *c*) and have each a long six-jointed palpus, the first joint small, the others of equal length, and the fifth joining the fourth in an oblique direction; lastly, the lower lip (fig. 8 *d*) is oval, and has three fleshy lobes, and two hairy four-jointed palpi. The eyes are black, oval and prominent; the ocelli are disposed in a triangle. The thorax is yellow on the under surface, red and black on the upper; the prothorax, the diamond-shaped central lobe of the mesothorax, the scutellum and a spot behind it on the metathorax are red.

The abdomen is in the female somewhat thick, cylindrical in the male, of an orange-yellow colour, the first segment being generally more or less black. The valves of the sheath in the female are also black at the tip. The saw and ovipositor are of a clear ochre-brown, rather elongated, somewhat curved, and transversely plicated (fig. 9). The legs are not very long; coxæ yellow; the anterior pair generally have some black spots at the base; femora moderately expanded, pale orange; tibiæ yellow, black at the ends, with a silky pubescence; tarsi rather long, white, with a black termination to each joint; the first four have rather large pulvilli on the under surface, the two last have sharp black claws.

The wings are pretty large, yellow at the base, translucent and iridescent at the tip. The whole anterior margin as far as the stigma is black; the stigma itself is also black, but gray at the end.

I have observed but few varieties; some examples have the antennæ entirely black. Two individuals, which, if I remember rightly, came from green larvæ, had large black spots on the middle of the breast.

It is remarkable that a species of Athalia occurs in Japan, which exactly agrees with the insect found in Europe, excepting only that the wings are smoke-coloured; there are some examples of this species or local variety in the Museum of Natural History at Leyden, collected during the voyage of Mr. Von Siebold. Why Fabricius should have given this species the name spinarum, and Panzer should have called it Centifoliæ, I cannot imagine; perhaps the first-named author may have found it on the blossom of the hawthorn and the latter have observed it on a garden rose; at all events it appears from what has been said above, that it has no connection with hawthorn or Rosaceæ. A very nearly allied species is named Rosæ, *L.*, probably through confusion with Hylotoma Rosæ, *F.*, the larvæ of which live on rose plants. It may be that Panzer, merely to indicate the relationship of the two species, has taken the name of Centifoliæ for that species which he thought was unnamed at the time he described it.

On the Sagacity exhibited by certain Bees and Ants. By FREDERICK SMITH, Esq., late President of the Entomological Society of London.

IN the number of the 'Zoologist' for May (Zool. 9055) Mr. Newman published some opinions and observations upon the cells of bees, and also indicated certain opinions as being held by myself upon that subject. My views as to the definition of instinct, in certain species of insects, is suggested in the same paper. I claim space for a few observations upon both subjects.

It will be admitted by every one, I imagine, that various quadrupeds readily acquire a variety of accomplishments, all being the result of teaching; and I readily admit the opinion that wasps, bees and other insects are at their birth, or, more correctly to express myself, on arriving at their perfect condition, gifted with all the skill necessary to accomplish the requirements of their particular economy.

In the paper alluded to above, I find what I conceive to be an oversight on the part of the author: I allude to the following:—"The bee, on the contrary, without any teaching, without any meditation, begins to make its beautiful and symmetrical cell the hour it is born." This passage, in my opinion, is calculated to inculcate what I believe to be an error. From inquiry I have ascertained that hive-bees, after leaving the cell for the first time, are some days in the hive before they take any part in the labours of the community. I can speak from observation as to wasps, having frequently reared them in my own apartment, and watched them through every phase of their labours: individuals of the species Vespa rufa, on emerging from their brood-cell, frequently have the faintest possible trace of the gay ornamentation that is known to characterise that species, and such individuals certainly remain some days in the vespiary before taking part in its labours. I do not for a moment suppose that during the time passed in the hive, before taking part in its labours, the wasp or bee acquires any additional skill through observation or teaching; I merely record the result of my own observation and experience for the purpose of correcting what I think is calculated to mislead.

To proceed: it is stated that the wasp or bee, in constructing its hexagonal cell "is as much an irresponsible agent as the hen that covers her egg with a calcareous shell before extrusion, and produces it of the best possible form for the purpose for which it is intended;" also that the building of the cells is an "irresistible act;" neither the brain of the bee or that of the hen having laboured in their construction.

My own observation of the habits of insects and the knowledge I have acquired from that of other naturalists, have irresistibly led me to the adoption of very opposite opinions. If those I have quoted above hold good as regards the wasp and bee, they must equally apply to all the recorded economies of the insect world. I will mention two or three instances of what I call insect sagacity, exhibiting skill, reflection, contrivance, &c.—in fact, a number of those qualifications which are usually summed up in the one debateable sense called *instinct*.

A little swarm of Trigonæ are on the wing; they are in search of some hollow tree or other suitable cavity adapted for their hive; a tree with a large hollow in the trunk is found; this hollow is some inches in diameter, as well as in length. Such a house is not adapted to their purpose; it requires, in fact, the front of the domicile built, and of course a doorway constructed: had this swarm flown twenty yards further a tree with a suitable hollow and also a suitable entrance would have been found. Although the tree selected is not ready for their purposes it matters little, the bees can by contrivance make it so; accordingly they collect a quantity of moist clay and build up the wall, leaving a suitable opening for their entrance and exit. Will it be argued that this is parallel to the formation of the calcareous covering of the egg in the body of the hen? Is no amount of intelligence exhibited in all this contrivance, and in the choice of a material so admirably adapted for the purpose required?

Let us now look in another direction. There is an army of the travelling ant on the march: onward they go, over hill and level plain, and down into the deep ravine; but they halt suddenly, a narrow stream intercepts their progress: they do not turn aside, such is not their wont, the difficulty must be surmounted. A low bush grows close to the margin of the stream; one of its branches overhangs the water; an ant is seen ascending the bush and traversing the overhanging branch to its furthest extremity: having reached this, it seizes the twig with its jaws, and suspends itself by them over the stream; another ant follows, and attaching itself to the legs of the first, hangs down likewise; this example is followed by others, until a chain of ants hangs over the stream; this is wafted to and fro until the ant at the extremity touches and clings to some twig or blade of grass on the opposite side: a suspension bridge is thus formed, and over this the whole army passes. Should no bush be found suitable for their purposes, what has been observed of their resources under such circumstances? Sometimes, if the stream is somewhat rapid, they form a floating chain, which, moving to and fro on the surface of the water, at length touches the opposite bank. I may record another contrivance adopted when a pond of still water interrupts their march: in such a case they have been observed to cluster together in masses, forming balls of ants, and in this condition they float on the water, and are wafted to the opposite shore. The late Mr. Foxcroft saw a number of these ant-balls floating across a pond, one of which he secured and placed in my hands; it proved to be the rare species Anomma Burmeisteri. Do these expedients on the part of the ants exhibit no ray of intelligence? Are they nothing more than the irresistible actions of irresponsible agents?

One further illustration, and I leave it to others to show that all the instances advanced prove nothing in support of my own opinion. There is a burrow in that gate-post, constructed with infinite labour last summer by Osmia aurulenta; it now contains a few males and four females, all matured, and each is gifted with the power capable in every respect of performing every act necessary for the attainment of the ultimate purpose of her economy. One of the females issues from the burrow; like her parent before her, she excavates a burrow in the gate-post; this is the work of days of almost unremitted labour. A second bee takes flight, and, at some little distance, alights upon a sunny bank of compact fine sand; such a bank is admirably adapted to her purposes; she at once commences to excavate; her task is light in comparison with that of her sister's that we left labouring at the gate-post, and in half the time occupied by the first, the second has completed her task.

Let us now attend to the third bee that is on the wing: passing the sunny bank, she makes her way, at length alighting on the thatch of an out-house; the thatch is composed of straw, twigs and reeds; amongst the latter is one the tube of which is exactly adapted for the nest-burrow of a bee; the Osmia observes this, and at once selects it for that purpose.

The fourth bee is buzzing about some tufts of grass, flying here and there apparently without any very settled purpose, but she alights on a stem of grass, at the foot of which lies a snail-shell; now the whorl of this shell is very different in construction to the straight tube in the post, sand-bank or reed; not only is it spiral, but also much narrower at one end than at the other; it is much too wide, in fact, to answer the purpose of the bee without alteration, or some mode of adaptation, but by availing herself of either of these expedients it will suit her purpose admirably; and "so thinks the bee." The bee does avail herself of this spiral tube of the shell, placing or building her cells longitudinally, so long as the width of the whorl is suitable to such a position; but, when it becomes too wide, she constructs one or two transversely.

Are these actions, so plainly exhibiting reflection, contrivance and skill, nothing more than the irresistible acts of an irresponsible agent? The author of the paper before alluded to speaks of the brain of the bee; surely no action in which the bee can possibly be engaged during the whole course of its existence can claim a greater exercise of its function.

I will, in the next place, make one or two observations on the assumption that I should deny the truth of Mr. Spence's definition of instinct: "Those unknown faculties implanted by the Creator, by which, independent of instruction, observation or experience, and without a knowledge of the end in view, they are impelled to perform certain actions tending to the well-being of the individual and the preservation of the species." I at once admit that I do differ in opinion, very materially, in my definition of the instinct of insects; in fact, it appears to me that the definition contains a contradiction of what it is clearly intended to enforce. The faculties are in the first place described as being unknown, and in the next line they are defined as "possessing no knowledge of the end in view." It is, however, to this latter definition I demur; in fact, I believe that of all impossibilities, perhaps none is greater than to draw a line between what is commonly called instinct and reason. Are we not really speaking of the same sense in both cases? Are not the faculties implanted in the ant, the bee and the wasp, modifications of reason?

I have no intention here to contest the principle upon which the hexagonal cells of bees and wasps are produced, but I freely admit that the cocoons of Microgaster alvearius are produced without any reasoning power being exercised by the apodal grubs; I am perfectly aware of the fact of their being the result of crowding: any single grub removed from the mass would undoubtedly have spun a cylindrical cocoon. The elastic eggs of Pentatoma become hexagonal in shape through the operation of the same principle; in fact, all cylindrical tubes and hollow spheres, if elastic and submitted to an uniform degree of pressure on all sides, will in consequence assume the hexagonal shape.

The basaltic columns are probably hexagonal through the operation of an opposite force. If an unshapen mass of clay were before me, and I by scraping or cutting removed externally all superfluous portions, I should produce an hexagonal body by another process. If, on the other hand, I were to use the clay, trowel in hand, I could build an hexagonal tube by another mode of operation: the single hand and the single wasp are alike capable of such construction; and this, I contend, is the mode of operation adopted by a number of individuals in the nests of many species of wasps.

Frederick Smith.

New Locality for Claviger foveolatus.—This peculiar insect appears to be not uncommon in the neighbourhood of Weymouth, where I discovered it on the 10th of April, in the nests of Formica flava, beneath stones on the Chesil Bank; and again, under the same circumstances, in the Valley of Friar Wooton, a place where the annual Dorsetshire Steeple-chases are held.—*G. F. Mathews; H.M.S. Warrior, May* 4, 1864.

Beetles in a Boat-house.—On Monday, the 14th of March, I accompanied my friend Mr. Thomas Nash, exhibitioner of Balliol, for a row on the floods, which, as all Oxonians know, covered the low-land for miles round at that time. My friend's ostensible object was fern-collecting—my own, entomologizing. The Editor of the 'Zoologist,' being a *savant* in both pursuits, may wonder why we should choose such a method: probably our inclination for a row was the real explanation. The row in question, however, proved no joke, and had it not been for the powerful arm and experienced boatmanship of my friend, these lines would probably never have been penned. By strenuous efforts, our boat was driven into a boat-house while we rested from our exertions. The result of this movement was the capture of a great number of beetles, which had evidently been driven from the land to shelter in the boat-house. Many small Staphs (Aleocharidæ, &c.), were everywhere to be found: unfortunately those which escaped the voracity of their own kind, and were transmitted to my friend Mr. T. Blackburn, from whom I received the names, were but a very limited number, and all the smallest things seemed to have disappeared. This I must, I am afraid, attribute to my own mismanagement. The survivors were as follows:—Aphodius fimetarius, A. prodromus, Agriotes lineatus, Pterostichus cupreus, P. strenuus, Pæderus littoralis, Xantholinus punctulatus, Lathrobium elongatum, Tachyporus Hypnorum, Stenus brunnipes? S. ater? besides some Bembidia, not yet named.—*E. M. Geldart; Rose Hill, Bowdon, March* 23, 1864.

Scent of Cicindela campestris.—Mr. Norman states (Zool. 8997), in answer to an inquiry of Mr. Archer, that he has never observed the scent of roses emitted by Cicindela campestris in this country, although he has in Germany. I have never noticed this scent when capturing specimens, but when killing them by means of boiling water have perceived a strong, though momentary, perfume, more resembling verbena than roses, in my opinion.—*William Ingall; 4, Albany Road, Camberwell, April* 7, 1864.

Proceedings of Societies.

ENTOMOLOGICAL SOCIETY.

April 4, 1864.—F. P. PASCOE, Esq., President, in the chair.

Mr. Pascoe thanked the Society for electing him to fill the Presidential Chair; and nominated as Vice-Presidents Mr. Stainton, Mr. A. R. Wallace and the Rev. Hamlet Clark.

Additions to the Library.

The following donations were announced, and thanks voted to the donors:—'Sitzungsberichte der Königl. bayer. Akademie der Wissenschaften zu München,' 1863, II. Heft 4; presented by the Academy. 'The Zoologist' for April; by the Editor. 'The Classification of Animals based on the Principle of Cephalization. No. III. Classification of Herbivores;' 'Note on the Position of Amphibians among the Classes of Vertebrates;' by the Author, James D. Dana. 'Stettiner Entomologische Zeitung,' 1864, Nos. 1—3; by the Society. 'Exotic Butterflies,' Part 50; by W. W. Saunders, Esq. 'The Natural History of the Tineina,' Vol. viii., containing Gracilaria, Part i., and Ornix, Part i.; by H. T. Stainton, Esq. 'The Intellectual Observer,' No. 27; by the Publishers. 'The Reader' for March; by the Editor. 'The Journal of the Society of Arts' for March; by the Society.

The following additions by purchase were also announced:—Grenier, A., 'Catalogue des Coléoptères de France.' De Marseul, S. A., 'Catalogue des Coléoptères d'Europe et du Bassin de la Méditerranée en Afrique et en Asie,' deuxième edition.

Election of Member.

P. H. Harper, Esq., of 30, Cambridge Street, Hyde Park Gardens, was ballotted for and elected a Member of the Society.

Exhibitions, &c.

Mr. Frederick Smith—after remarking that his attention had been called to a note appended by the Editor of the 'Zoologist' (Zool. 8975) to an extract from his Address to the Society on the 25th of January last, the passage extracted being that relating to the luminosity of Fulgora, and the note being in the following words, "I believe the Honduras fire-fly with intermittent light is an Elater; if so, the Fulgora question remains *in statu quo*,"—said that he had since had supplied the further evidence of another eye-witness of the luminosity of the lanthorn-fly. Mr. James Smith, of 23, Wilton Row, Queen's Road, Dalston, made the following statement:—

"The Fulgora candelaria is found most plentifully between the months of May and August; it is occasionally seen in the winter, but these, I think, are hybernated specimens; it is then not luminous, and very much faded. In the summer it has a pale blue or green light at the end of the snout, which may be considerably augmented by a gentle pressure of the insect; it is brightest in the female. It is common throughout all China, and called the 'Star of Eve,' 'Eye of Confucius,' 'Spark-fly'; and the same insect is called, in the winter, the 'Flying Elephant,' perhaps in reference to its long proboscis. When the insect is settled the light is more luminous than when it is flying, and when the male and female have mated it is wholly extinguished. The male, I believe, does not survive many hours, as I never caught one in the summer which was not luminous. They fly in swarms, and I have repeatedly taken two or three species in the same swarm. They are most plentiful in gardens, though they are found everywhere. The Chinese ladies catch them and imprison them in a fine gauze net, and wear them in their hair."

Mr. W. F. Evans said that Sir John Barrow's experience was in favour of the luminosity of Fulgora.

Mr. Newman remarked that his note on Mr. F. Smith's former statement was confined to that part which referred to the Honduras fire-fly, *i. e.* to Fulgora laternaria, not F. candelaria. Nothing that had been adduced that evening had any bearing upon the luminosity of F. laternaria.

Mr. Bates said that Fulgora laternaria was pretty common on the Upper Amazons; he had been aware of Madame Merian's statement, and had observed the insect closely; but he had never found it luminous, and, what was stronger than the negative evidence of any single observer, there was no rumour or idea existing amongst the natives to the effect that it was luminous. The natives were well acquainted with the insect, which was the subject of fables current amongst them; for instance, a tale was told of one of these insects having emerged from the forest and attacked a boat's crew of nine persons, eight of whom were killed by the poisonous creature, and the pilot only escaped by jumping into the river. But though the fly was thus reputed to be venomous, there was no story current of its being luminous. Mr. Bates himself was of opinion that Fulgora laternaria was not luminous, and (strange as it might seem) that the Honduras correspondent on whose statement Mr. F. Smith relied had attributed to the Fulgora what, in fact, was the luminosity of a Pyrophorus.

Mr. Newman (on behalf of Mr. Butler, who was present as a visitor) exhibited a number of insects embedded in amber and gum-animè differing from those of which an account was given by Hope in the first and second volumes of the Society's 'Transactions.' The amber was from the Baltic, the gum-animè (which, by the bye, was a resin, not a gum) from the East Indies; one of the amber-insects was peculiar from having enclosed with it a globule of air and a globule of water.

The President exhibited several new Australian Longicornia, presented to him by Mr. F. G. Waterhouse, of Adelaide, some of which were taken by that gentleman during the recent exploring expedition under Stuart; among the more interesting was a new genus, in some respects connecting those remarkable and isolated forms Bimia and Hesthesis. Also a considerable number of new species from Gawler, near Adelaide, part of a large collection for which he was indebted to Mrs. Kruesler and Mr. Odewahn; one of these had the appearance of a Malacoderm, for which, at the first glance, it might very readily be taken. It might, in fact, be regarded as another case of "mimetic resemblance"; but if so, there was this peculiarity about it, that the stronger insect was here imitating the weaker, which seemed not quite consistent with the theory that the imitated form was copied with a view to the protection of the imitating.

Mr. A. R. Wallace said that the case was quite consistent with the theory of mimetic resemblances, and that that theory did not depend upon the relative strength or weakness of the imitated or imitating forms; an insect might be very weak in structure, and yet be a proper subject for mimicry; many insects of weak structure were extremely abundant, were, in fact, dominant species; such species no doubt possessed some protection against their enemies with which we were unacquainted, and of which other species of stronger structure were deprived; and having that protection, whatever it might be, they were on that account fit and likely subjects for imitation. So far from conflicting with the theory, he felt no surprise whatever at finding a structurally-stronger insect mimicking a Malacoderm.

The President also exhibited diagrams of the under surface of the abdomen of the females of Obrium cantharinum and other Longicornia, showing the presence of large lumps or tufts of hair on particular segments; he was anxious to ascertain whether such a structure was invariably present in the female; he had reason to believe that in some Australian genera (Penthea and Symphyletes) it was not invariably present, but further observation was required. If it should prove that it was not invariably present in the female, this would furnish another instance of "dimorphism," by which he (Mr. Pascoe) meant a case where there was an addition to or alteration of a part or organ; the term, in his opinion, ought to be confined to such a phenomenon, and was not applicable to simple variation, such, *e.g.*, as variation in colour.

Mr. A. R. Wallace exhibited specimens of Papilio Memnon, P. Pammon, P. Theseus, P. Ormenus, P. Erectheus and P. Tydeus, for the purpose of illustrating his views on "polymorphism." Mr. Wallace remarked that *he* did not apply the term "dimorphism" to simple variation; on the contrary, he regarded "polymorphism," of which "dimorphism" was but the first and least complicated stage, as a totally different phenomenon from "variation," and one which required a separate name. Under the common term "variety" many distinct phenomena were confounded; he proposed to confine that term to those cases in which there was indefiniteness and irregularity in the variation. "Variation," then, was an indefinite and inconstant phenomenon, the instances of which passed from one to the other by irregular, often by insensible, gradations; "polymorphism," on the other hand, consisted in the existence of several distinct forms of the same insect which do not graduate into each other. Thus, in Papilio Memnon, the male was in each locality constant; it had rounded hind wings, and was always nearly black, with a few ashy rays; the female, however, existed under two distinct forms; the first had the wings shaped like those of the male, but had a very different colouration, being more or less olive-coloured, and often banded on the hind wings with whitish yellow, and with marginal black spots; the second form of female differed remarkably from the first, the hind wings being produced into a large spatulate tail, and marked with white patches radiating from the base. Both these forms exhibited varieties in the same locality, but there were no connecting links between them. The males paired with both forms of female, and in each case the resulting brood assumed the distinct forms above described. This was a case of dimorphism. Papilio Pammon was a parallel case; there was a form of female resembling the male, and there was a second aberrant form of female, *viz.* the form which had been called P. Polytes: he believed that P. Romulus would prove to be a third form of the female of P. Pammon, though of this he had not evidence at present; but the male of P. Romulus had never been found, whilst the females occurred along with P. Pammon in every collection from India: if that were so, then P. Pammon would exhibit an instance of trimorphism. P. Ormenus was certainly trimorphic, for three distinct forms of female were found, all differing greatly from the male; and Mr. Wallace had reason to believe that to some males of Papilio as many as four distinct wives must be assigned. These forms had hitherto been classed as varieties, but the physiological differences presented by them were striking.

Mr. Wallace further distinguished between a "variety" and a "local form" or "race," denoting by the latter term a form which kept distinct from the parent stock and propagated itself independently: such a form was not a "variety" by reason of its constancy and the absence of intermediate links, and could not be considered a "species" by reason of the comparative unimportance of the characters in which it differed from the type-form. The subject of Mr. Wallace's remarks had been treated by him at length in a paper recently read before the Linnean Society: he further illustrated the phenomenon of polymorphism by the following hypothetical case:—Imagine the discovery of an island inhabited by white men, and black (negro), red (Indian), and yellow (Chinese) women, and in which the union of these variously-coloured parents produces children which always resemble one or other of the four above-mentioned forms, no intermediate forms ever occurring; the boys are always white, whilst the girls are black, red or yellow, but without any necessary connexion with the colour of the mother, so that a black girl may be the offspring of a white father and of either a black, red or yellow mother. Such a phenomenon would certainly be an extraordinary one, but it was exactly parallel to what took place with the exhibited species of Papilio.

Gen. Sir John Hearsey remarked that so long ago as 1831 he had captured Papilio Pammon and P. Polytes *in copulâ*, had killed the pair *in situ*, and so sent them to Prof. Westwood; in which position they were to be seen at Oxford to this day.

Mr. Waterhouse enquired whether there was any evidence of the fertility of the abnormal females, since on theoretical grounds it might almost be expected that they would be unproductive.

Mr. Wallace replied that he believed one of the abnormal females then exhibited could be seen to be full of eggs.

Prof. Westwood exhibited a butterfly recently received at the Oxford Museum from M. Snellen van Vollenhoven; the specimen was from Ceram, and it appeared to him to differ from Papilio Peranthus only in its large size and to some extent in its colouring; he found no structural difference whatever, and he begged to exhibit it as P. Peranthus, *var.*; it seemed to him to be precisely one of Mr. Wallace's "local forms," but Mr. Wallace informed him that *he* should describe it as a new species.

Mr. A. R. Wallace said that if structural difference was necessary to constitute a species, two-thirds, or probably nine-tenths, of the existing species must be abolished; the difference between a local form and a species was one of degree only, and in his opinion the butterfly exhibited possessed characters sufficient to entitle it to specific rank.

Prof. Westwood read a description of a gigantic Heteropteryx, the type of which was preserved in spirits in the Oxford Museum; it was named H. Hopei. Also a description of a new species of leaf-insect, one of the distinguishing characters of which was that the abdomen had no rounded lobes; this was described under the name of Phyllium Feejeeanum.

Mr. S. Stevens exhibited a box of insects recently received from Mr. Diggles, of Moreton Bay, Queensland; they consisted principally of Lepidoptera, with a few Orthoptera, admirably preserved.

Mr. Sharp exhibited a single specimen of a beetle new to this country, the Stenus Kiesenwetteri, which he had captured at Wimbledon. The species appeared to be a rare one, but had occurred in Spain and in Bavaria.

Capt. Cox sent for exhibition some photographs of insects, the execution of which excited the admiration of all; they were very nearly, but rather under, the natural size.

The Secretary mentioned that the name of Sosxetra, proposed by Mr. F. Walker for a new genus of Hymenoptera (Chalcididæ), Trans. Ent. Soc. Ser. 3, vol. i. p. 370, must, according to the ordinary rules of nomenclature, be sunk, since the same author had, at p. 84 of the same volume, described a new genus of Lepidoptera under the same name.

Mr. Frederick Smith said that in stating the contents of the late Mr. Curtis's British Collection, in his Address to the Society at the last Anniversary Meeting, he had made a serious mistake. See 'Journal of Proceedings' for 1863, p. 198. The actual number of specimens was as follows:—Coleoptera, 9405; Lepidoptera, 7200; Hymenoptera, 7715; Diptera, 5878; Neuroptera, 1165; Hemiptera, 1673; Homoptera, 244 specimens.

The Rev. Hamlet Clark communicated extracts from a letter recently received from Mr. John Gray, who was collecting insects at the Cape de Verdes. The letter was partly written from the Island St. Nicholas, under date 22nd of February, 1864, and partly from Porto Grande, St. Vincent, 29th of February, 1864. Eight days had been spent in St. Nicholas, but as regarded Entomology the expedition was a failure; it was the mid-winter of that country, and more beetles could have been got out of any turnip-field on any Christmas-day in England than he had been able to procure there from the whole of the vegetation put together. Nevertheless a few nice beetles were captured—a handsome Dytiscus, a large tropical Gyrinus (Dineutes?), and eight or ten species of Harpalidæ, taken high up on the mountains (Nebria, &c.). Altogether, however, a list could not be made of more than twenty species, of which about five were Heteromera, several species of which were in profusion under every stone. There were no signs anywhere of abundant insect-life; nothing was seen upon the walls of the houses, nothing upon the flowers, nothing anywhere except the Heteromera under stones. A few fine spiders had been obtained, and carefully preserved in spirits.

Mr. Douglas C. Timins, under date of Cannes, March 29, 1864, communicated the following notes of his entomological observations made during the winter months in the Departement des Alpes Maritimes:—

"During the early part of November Papilio Podalirius and Gonepteryx Cleopatra appeared, though in small numbers. Cynthia Cardui and Vanessa Atalanta were extremely abundant, and continued on the wing throughout the winter. Orthoptera were very numerous in November and December: amongst them I noticed Acridium lineola, Gryllis macula[illegible], G. azurea, G. Italica, G. cærulescens, &c., Mantis religiosa and others. Cicindelidæ were very abundant (the common C. campestris and C. hybrida, as well as several other species). In the beginning of December I took a great many specimens of Polyommatus Bœticus and the allied P. Telicanus: both these species fly round the tops of bushes, very much after the manner of the Theclas, between which genus and Polyommatus they form in habits, as well as in appearance, a connecting link. P. Unionalis appeared in fir-plantations and Lycæna Phlœas abounded everywhere, as did Lasiommata Ægeria, L. Megæra, L. Mæra, Argynnis Lathonia and Macroglossa Stellatarum. The larvæ of Papilio Machaon and P. Podalirius continued feeding until the middle of December, and this was also the case with numerous other species which in England assume the pupa state some three months earlier. During January few species of Lepidoptera were seen; Pieris Daplidice, however, appeared, and also *fresh* specimens of Colias Edusa and C. Myrmidone, and *battered* ones of Vanessa Io, V. Atalanta, V. Antiopa, V. Cardui and V. Urticæ. Examining moss appears to be of little or no use in this locality; probably the

Coleoptera rarely hybernate in so mild a climate, and yet few were taken on the wing or crawling about, except Carabus monilis and Chrysomela Populi, and some of the genus Aphodius. This neighbourhood seems poor in Dytiscidæ, for I met with few, and these only the commonest species. In February the weather was extremely bad, and the only Lepidoptera which appeared were Lasiommata Ægeria, L. Mæra and Colias Edusa; early in March Papilio Podalirius reappeared and Gonepteryx Rhamni and G. Cleopatra also. During this month Colias Edusa, C. Myrmidone, Pieris Daplidice (very common), Anthocharis Belia, Vanessa C-album, V. L-album, Pontia Brassicæ and P. Chariclea, Thais Rumina, Thecla Rubi (very common), Polyommatus Alcon (?) and Saturnia Carpini appeared; also Vanessa Io and the other common Vanessidæ. Several species of Cicindelidæ occur now (March 24th) in the rocks, but I have not yet been able to identify them all; and of Libellulæ, Æshna grandis, Libellula forcipata, L. depressa, &c. A good many species of Hemiptera occurred in December and January, but I have been obliged to reserve their nomenclature for some future time, as I can obtain here no books on that order. Among the larvæ found in December were Deilephila Euphorbiæ, D. Galii and Acherontia Atropos. The pine woods have been full of the larvæ of one of the processionary moths, living in society under white silky nets, and proceeding in lines or chains, sometimes thirty feet long (each larva is hardly an inch and a half in length), to bury themselves preparatory to assuming the pupa state: on reaching a suitable place for this purpose, the chain of larvæ disperses, and each one proceeds to bury himself, usually, however, near his comrades, so that when one pupa was found by digging, more were certain to be obtained within a few inches of the same place."

Paper read.

Mr. Frederick Smith read a paper "On the construction of Hexagonal Cells of Bees and Wasps." This was illustrated by the exhibition of a collection of nests, among which were those of Icaria guttatipennis, Nectarina Lecheguana, Tatua morio, Polistes tepidus, P. Tasmaniensis, Vespa vulgaris, Apis mellifica, &c.: among the most remarkable was a nest of Polistes Tasmaniensis, in which a single central cell had been prolonged and carried to a considerable distance above the level of the surrounding cells; this prolongation was alleged to be hexagonal, and much use was made of this in the course of Mr. Smith's argument. Mr. Bates, however, took issue with Mr. Smith on the hexagonality of this part, and declared it to be, in his opinion, as nearly circular-cylindrical as possible. In contradistinction to the "circular theory" expounded by Mr. Waterhouse at the previous Meeting, Mr. Smith's might be termed the "hexagonal theory," but it will give a better idea of the main argument, if we denote his view of the construction of the cells as the "intentional theory." The hexagonal form of cell was described as "the ground plan laid down by the Great Architect," and the bees were the builders who carried out his designs: it was argued that both bees and wasps began instinctively and with a primary intention to construct hexagonal cells; and so strong was the "hexagonal principle" guiding them in their operations, that one wasp, Apoica pallida, not only built hexagonal cells, but occasionally formed the entire comb of a hexagonal shape. Reference was also made to the artificial bases or foundations for cells used by the German bee-keepers, such foundations being hexagonal; and from this it was argued that these hexagonal ground-plans must be exactly such plans as bees were accustomed to erect their cells upon, or at all events that the fact of bees at once accepting the plan furnished them was strongly in favour of the supposition that bees when left to their own resources construct a precisely similar basement. In fine, Mr. Smith could not regard bees and wasps as creatures that would instinctively construct circular-cylindrical cells, but whose labours always eventuated in the production of hexagonal ones; on the contrary, he regarded them as creatures that would instinctively construct hexagonal cells, and the hexagons actually produced were only the carrying into effect the original intention of the builders.

Mr. Marshall (who was present as a visitor) asked Mr. Smith whether he thought a hexagonal foundation would be laid in a case where it was not in contemplation to form other cells in immediate juxta-position? or would a cell be hexagonal if there were no other cells adjoining to force it into that form? In his opinion, the hexagonal shape was due to the fact that there were other, as it were, competing cells around, and to the pressure of such competing cells on that whose form they thus determined: this also accounted for the fact that the exterior cells were circular. Competition and pressure were the causes of the hexagonal shape of the cell.

Mr. Newman enquired to what extent Mr. Smith would carry his principle of intention? Would he apply it equally to the case of the larva-cells of Microgaster alvearius? Was it applicable to the aggregation of lenses in the eyes of insects? or could it afford any explanation of the hexagonal form of pillars of basalt?

Mr. Waterhouse thought he had, in his paper, anticipated and answered most, if not all, of Mr. Smith's objections to the circular theory; he admitted, however, that the nest of Polistes Tasmaniensis presented a difficulty, but thought an isolated instance of unnatural formation was insufficient to overthrow the theory; he admitted also Mr. Smith's greater practical acquaintance with the nests of bees and wasps; but he considered the vice of Mr. Smith's paper to be that it overlooked or did not give sufficient attention to the circular marginal cells: according to the "intentional theory," the marginal cells ought to be as exactly hexagonal as the rest, but this was not the case; it was upon observations of the marginal cells that the "circular theory" was grounded, and for their form, as well as for the hexagonal form of the surrounded cells, the circular theory accounted, whereas the intentional theory of Mr. Smith applied to the central cells only, and left the other case entirely unexplained. At any rate the two theories were before the Society, and he hoped the two papers would be published together, so that Members, caring naught for either theory as such, might impartially draw their conclusions for themselves.

New Part of the 'Transactions.'

A new Part of the 'Transactions,' Series 3, Vol. i. Part 9, being the concluding part of the volume, and the first published during the present year, was on the table.

May 2, 1864.—F. P. Pascoe, Esq., President, in the chair.

Donations to the Library.

The following donations were announced, and thanks voted to the donors:—'Mémoires de la Société de Physique et d'Histoire Naturelle de Genève,' Vol. xvi. Parts 1 and 2; Vol. xvii. Part 1; presented by the Society. 'Proceedings of the

Royal Society,' Vol. xiii. No. 61; by the Society. 'Journal of the Proceedings of the Linnean Society,' Vol. vii. No. 28; by the Society. 'Notes on Sphærularia Bombi,' by John Lubbock, Esq., F.R.S., Pres. Ethn. Soc.; by the Author. 'Sitzungsberichte der Königl. bayer. Akademie der Wissenschaften zu München,' 1863, II. Heft iv.; by the Academy.' 'The Journal of Entomology,' No. 8; by the Proprietors. 'The Journal of the Society of Arts' for April; by the Society. 'The Reader' for April; by the Editor. 'The Zoologist' for May; by the Editor. 'Stettiner Entomologische Zeitung,' 1864, Nos. 4—6; by the Society. 'Descriptions of New Genera and Species of Phytophaga,' by J. S. Baly; by the Author.

Exhibitions, &c.

Mr. Dunning (on behalf of Mr. R. S. Scholfield, who was present as a visitor) exhibited a specimen of Hydrilla palustris, captured by Mr. Scholfield in Quy Fen, Cambridgeshire; the specimen was a male, and was disturbed from grass on the afternoon of the 29th of May, 1862. This Noctua was introduced into the British List on the authority of an example in the possession of Mr. Allis, taken some years ago near York; but the species was not included (or rather was given as a "Reputed British Species") in Mr. Doubleday's 'Synonymic List of British Lepidoptera' (ed. 1859).

Captain Cox exhibited various coloured drawings of Lepidopterous larvæ; and the original of his "larva-index" or "larva-dictionary," the plan of which was described by him at a recent Meeting of the Society. (See 'Journal of Proceedings' for 1863, p. 186.)

Captain Cox also exhibited a number of Lepidopterous larvæ which had taken possession and were consuming the contents of a large bin of bran; in the previous year he had found Aglossa pinguinalis extremely abundant in his stables and outhouses, and hence thought it probable that the larvæ were of that species; it was, however, remarkable that the larvæ of so fat and greasy a moth should be nourished on so dry a substance as bran. Mr. Dunning thought the larvæ were more probably those of Pyralis farinalis; and Mr. Newman suggested Ilithyia sociella.

Prof. Westwood exhibited nine species of Charaxes (three of which were unique specimens) from the Zambesi, whence they had been sent by the Rev. H. Rowley; each specimen was placed in a separate envelope, a considerable number might thus be placed in a box, and the whole had travelled in this manner without sustaining material injury.

Mr. A. R. Wallace exhibited various species of Papilio, Eronia and Pieris, with the intention of showing the effect of locality in producing change of form in insects. Numerous species inhabiting the island of Celebes were produced, and in each case in juxta-position therewith was its nearest ally from the adjoining islands. The Celebes insects, in every instance exhibited, had the costa of the anterior wings much more strongly arched than was the case with their congeners with which they were compared. Mr. Wallace remarked that changes in colour which were due to locality had been frequently noticed, but of instances of a change of form only few had been recorded; Mr. Bates, however, had mentioned some as having come under his observation in South America. In the Eastern Archipelago, he (Mr. W.) had found that the butterflies inhabiting the islands which formed the eastern half were generally larger than those in the western half; and, especially in the Papilionidæ, that Celebes and Amboyna produced the largest specimens. Some species which in India were found with a large tail appended to their hind wings, possessed only a small tail in the

Indian Islands, which ceased altogether or was reduced to a mere tooth in the islands of the Pacific; of this Papilio Agamemnon was an example. The island of Celebes was as nearly as might be the centre of the Eastern Archipelago, and the butterflies of that island, especially the Papiliones, possessed the peculiarity in the form of their wings to which he had invited attention; sixteen or seventeen species of Papilio were found in Celebes, and, with a single exception to be afterwards noticed, all were distinguished from their allies in the other islands by having the upper wings strongly arched, in lieu of a gentle and gradual curve, or, if he might so term it, a flat bend. The same distinction existed also in many Pieridæ and in a few Nymphalidæ, but he had not observed it in other groups of butterflies. Mr. Wallace had a theoretical explanation to offer of this phenomenon; he conceived that the insects had become modified in form by the external circumstances to which they had been subjected, and that this modification was to be accounted for by some physical or organic change which had occurred in Celebes, but not in the now adjacent isles. Rapidity of flight was generally supposed to be the consequence or a property of the falcate form of wing; he (Mr. W.) was inclined to think that the falcate form gave greater facility in twisting or turning about; if that were so, the Celebes form of butterfly-wing would give the insect this additional facility, and thus enable it more easily to escape from its enemies. If, then, the Celebes insects were supposed to have been formerly subject to great persecution, those with the arched form of wing would have the best chance of escaping, the less favoured forms would be gradually killed off, those that survived would owe their existence to the form of their wings, their offspring would resemble and some few would exceed them in the possession of the advantageous shape, and the specimens with the best developed wings being naturally selected in each succeeding generation would lead to the gradual and regular increase of the peculiarity. But then it might be asked, How is it that only a few of the butterflies have the peculiarity in question? The answer was, that different insects preserve their existence by different means; one may escape by means of its power of flight, the habits of a second may enable it to avoid its foe, a third may owe safety to its colour, whilst a fourth may be positively distasteful to animals which prey upon insects. Thus the Danaidæ, though slow of flight, were very abundant and were the subjects of mimicry or imitation by other species; in all probability they owed their immunity from destruction to the strong and unpleasant odour which they indubitably possessed. It was manifest that where another means of escape already existed, the principle of selection would not be brought into play; the peculiar form of wing would not be wanted, and therefore would not be acquired. The obscure Satyridæ were doubtless protected by their colour; the majority of the Nymphalidæ had already sufficient power of flight, and those of that group which had acquired the arched form of wing were precisely the species which possessed only about the same power of flight as a Papilio. The single Celebesean Papilio which had not assumed the arcuate form of wing was one belonging to the Polydorus group, a group which was itself imitated by other Papiliones, and which therefore was doubtless provided with some special defence, though the nature of it was unknown to us.

Prof. Westwood, after remarking upon the pleasure he always derived from Mr. Wallace's speculations, whether he agreed with them or not, said that he was unable to follow Mr. Wallace in tracing the phenomenon to the causes assigned by him; arched wings were not necessarily, or even generally, accompanied by the greatest rapidity of flight; and if the original form of the butterfly must be varied, if one species must imitate another, he (Prof. Westwood) thought it far more probable that the variation would consist in getting stronger muscles to their bodies, as in the species of Charaxes he had that evening exhibited, rather than in a minute change in the curve of the wing.

Captain Cox thought that the swiftest fliers had the straightest wings, as, *e.g.*, the Sphinges, where the costa was scarcely arched at all.

Mr. Newman also was unable to connect an arcuate wing with rapidity of flight, and instanced the straight costæ of the swift-flying Diptera.

Mr. F. Smith referred to some of the swiftest Hymenoptera, which had pointed wings, but with perfectly straight costæ.

Mr. Baly said that the arched form of wing might be advantageous in giving a greater power of twisting and turning about, rather than in giving greater rapidity of flight; and this, he thought, was what Mr. Wallace had suggested.

The President observed that the theory seemed to be based upon the supposition of a gigantic persecution to which the butterflies had been subject; but was there any evidence of the existence of such persecution? had Mr. Wallace ever seen the insects actually pursued by birds or other enemies? It seemed to him that persecution, to the extent to which it now occurred, was altogether inadequate to account for the magnitude of the result attributed to it.

Mr. Bates said that he had frequently observed in South America that the paths were strewn with the wings of butterflies; and in this country it was not an uncommon sight to see the Pontiæ pursued by birds, and sometimes escaping by means of their tortuous or "dodging" flight.

Captain Cox had recently seen forty or fifty specimens of Brephos notha destroyed by tom-tits in a single morning.

Mr. F. Smith remarked that, on the persecution principle, great change must be impending in the shape of wing of the butterflies of the London district.

Prof. Westwood asked whether Mr. Wallace had observed the twisting or "dodging" flight to be conspicuous in the butterflies which have largely-developed wing-tails? or whether the tails contributed to or affected the flight in any, and, if any, in what manner?

Mr. Wallace replied that he had not observed that the wing-tails had any influence upon the flight of the insect; he did not think they affected the rapidity, or that they acted as a rudder, and he was at a loss to assign any use to those appendages. With respect to the other points which had been touched upon, there was in some cases an increase of muscular power as well as an increase of curvature of the wings, but the wing of a butterfly was far more liable to variation than the body of the insect; that organ was therefore more accessible to the operation of the principle of selection, and a modification of its form was consequently more readily produced. Most of the instances of swift-fliers with straight wings which had been adduced (as *e.g.* the Sphinges) were insects with the strongest bodies and the greatest muscular power; moreover, he did not maintain that any insect with arched wings would have a more rapid flight than any other with straight wings; all that he had argued was, that, as between two closely allied species, the one which had the wings most arched would have the flight most rapid; for instance, he should expect a Sphinx with arched wings to fly more rapidly than a Sphinx with straight wings. But in truth, though he had referred to the supposed concomitancy of falcate wings and a rapid flight, his own notion was (as had been correctly stated by Mr. Baly) that the arched form was chiefly useful in giving greater power of turning or twisting. As to the enquiry whether he had seen the butterflies actually pursued, he admitted that he had not to any great extent; he offered his explanation as a theoretical one; but he thought it could scarcely be doubted that butterflies were subject to the attacks of numerous depredators.

Paper read.

The Secretary read a paper, "On the Reversion and Restoration of the Silkworm," by Captain Thomas Hutton, F.G.S., of Mussooree, N.W. India.

The author attributed the enormous loss of silkworms by "muscardine" and other diseases, and the consequent diminution of the crop of silk, to the combined effects of bad and scanty food, want of sufficient light and ventilation, too high a temperature, and constant interbreeding for centuries of a debilitated stock. He asserted that there was no such thing now in existence as a perfectly healthy domesticated stock of silkworms; and moreover, that it was useless to seek for healthy seed, for whether in Europe, Persia, India or China, the worms were all equally degenerated, or, if there were a difference at all, it was in favour of the European race. He had for several years been experimenting upon Bombyx Mori, with a view, if possible, to reclaim the worms, to restore to them a healthy constitution, and to induce them to *revert* from their present artificial and moribund condition to one of vigour and permanent health. The occasional occurrence in a brood of one or more dark gray or blackish-brindled worms—the "vers tigrés" or "vers zébrés" of the French—contrasting strongly with the pale sickly hue of the majority, must have been noticed by all who have had experience in rearing silkworms; such occurrences have been always spoken of as indicating variety arising from domestication. The author had endeavoured, by a series of experiments, to ascertain the cause of this phenomenon, his conviction being, either that the species had at some time or other been crossed by another of different colours, and that Nature, as sooner or later she always would do, was making an effort to separate them, or that the original colour of the worm had been dark, and an effort was being made to *revert* from a sickly condition to the original healthy starting-point. He accordingly picked out all the dark-coloured worms and reared them separately, allowing the moths to couple only *inter se*, and the same with the white worms. In the following spring the one batch of eggs produced nearly all dark brindled worms, whilst the other batch produced white worms, sparingly interspersed with an occasional dark one; these latter were removed into the dark batch, which was also weeded of its pale worms. In the third year the worms were still darker than before, and were always larger and more vigorous than the pale ones, giving larger and better-stuffed cocoons. Just as the eggs of the third year had been collected, a violent gale of wind upset the whole, but in the spring of 1862 the author recommenced *de novo*, and went over the same ground again. The few dark worms picked out escaped disease altogether, though reared in the same manner, in the same room, in the same temperature, on the same quality of food as, and in close contiguity with the others. In due time they spun cocoons, and produced moths, which, coupling *inter se*, deposited a fair stock of eggs, with which the experiments were continued in 1863. The eggs began to hatch on the 16th of March, and no sign of disease was apparent until the moths came forth, when many still showed defects in the malformation and dark spotting of the wings. As compared, however, with the previous year there was decided improvement; still there were too many white worms in the brood, but there was no symptoms of disease, the worms attained a larger size by a quarter of an inch and produced larger cocoons, and the moths laid good-sized eggs, great numbers of which adhered firmly to the paper upon which they were deposited, and many of the male moths displayed unusual vigour in flying in search of the females. But still more extraordinary was the fact that some of the eggs of Bombyx Mori of the spring crop of 1863 began to *hatch again for a second crop* on the 7th of August; these were all of the dark stock. The hatching continued throughout August, and occasionally even to the 23rd of September, when, through fear that the supply of leaves might fail, the eggs were removed to a temperature below 70° Fahr., in order to check the hatching. The worms which were then hatched throve and spun good cocoons, superior in size to those of the spring crop; in due time the moths appeared and were fully twice as large as those of the spring, depositing large well-formed eggs. In the beginning of December, to the author's dismay, more worms were hatched from the spring batch, and they continued to come forth at the rate of forty or fifty daily in a temperature of 53° Fahr., until, there being no more leaves upon the trees, the remaining eggs were placed in the open air at night, in order that the hoar frost might put a stop to further hatching. The whole of these worms were of the dark kind, and no white ones appeared amongst them as in the spring. This circumstance, so unusual with Bombyx Mori, the author attributed entirely to an accession of health and strength in the black worms; he regarded the occasional occurrence of the dark form in domestication as an attempted return on the part of Nature to the original colours and characteristics of the species, and considered the whiteness of the generality of the worms as a positive indication and proof of the destruction of the original constitution; in fact, the dark worms were the original and natural worms. This conclusion was further supported by arguments deduced from the strong similarity in the disposition and arrangement of the markings to those of the existing wild races in India, and by analogy to the general fading in domestic stocks of the original colour, to give place to piebald and finally to white. The author had long entertained the idea that the production of white cocoons (except in those cases where the white was permanent and constant in all climates) was a strong sign of degeneracy, the white cocoons being more abundant where the temperature was high than in more temperate climes; the whiteness of the worms and the white cocoons were both indications of failing constitution, evidencing the existence of a higher temperature and more artificial treatment than was conducive to the health of the insect. The author proceeded to argue that the good quality of the silk produced was no proof of the general health of the insect; it was the quantity, rather than the quality, of the silk that was affected by the present maladies; too great fineness of the silk was, in fact, an indication of too high a temperature, and of the consequent degeneracy of the worm. After considering at some length the question "What species of mulberry-tree is best adapted for the nourishment of the silkworm and for the production of good silk?" the author concluded by recommending the sericulturist to separate his dark worms from his general stock, to set them apart for breeding from, and to annually weed out all the pale-coloured worms; in the course of three or four years he would be able to cast aside his present sickly stock, and would have a stock far healthier than had ever before been seen in Europe.—*J. W. D.*

Monkeys in Africa.—The most attractive of all the native inhabitants are the troops of monkeys which we saw disporting themselves among the wood on the opposite side of the gorge. These creatures, which are of the same species as those of the Rock of Gibraltar, descend in the morning and evening to drink at the Chiffa; and, at the approach of wheels, they may be seen scrambling promiscuously up the mountain side, mothers carrying their young, some on their back, others in their arms, and frequently turning, rushing up a tree, and, after a hasty glance at the passing traveller, chattering and grinning as monkeys know how. Now and then a fellow older and bolder than the rest will remain ensconced among the branches of a chesnut-tree, and take a very close survey of the intruders.—'*The Great Sahara,' by H. B. Tristram*, p. 38.

Harp Seal in Shetland.—Several harp seals are now to be seen in the deep sheltered Voe at Baltasound. This species can scarcely be considered very rare here, but it is said only to occur in bad weather, and certainly the present visit forms no exception to the rule, the wind having for some days been blowing heavily from N.E., accompanied by sleet and snow.—*Henry L. Saxby; Baltasound, Shetland, March* 14, 1864.

The Grampus in the River Parret, Somersetshire.—On the 21st of March ten of these huge creatures came up the Parret to within five miles of Bridgwater, following the course of the river, or three miles in a straight line; they then returned about four miles down the river, or to about half a mile below the village of Combwich, when they were all captured by means of harpoons and spears. Two of them were brought up to Bridgwater and exhibited: these I saw; one of them was twenty-three feet three inches long, measured in a straight line, and sixteen feet round at the largest part; the other was very much smaller, being but thirteen feet long. Of the other eight, one is said to have been rather longer than the larger of the two which were brought to the town, but not thicker; another, still smaller than the smaller of these, being but eleven or twelve feet long; the rest are described as varying in length from eighteen to twenty-one feet. They agreed well with the figure and description in Bell's 'British Quadrupeds,' except that the fins did not appear to me quite so large in proportion to the whole body as the description gives them.—*Thomas Clark; Halesleigh, April* 12, 1864.

The White Camel of the Sahara.—The most peculiar appendage of the Touareg is his magnificent "mahari," or white dromedary, as indissolubly associated with these people as the horse is with the sons of Ishmael. This graceful creature, which may generally be seen kneeling in the souk of any M'zab city, with its fawn-coloured head and neck towering above the camels round, bears the same relation to them that the thorough-bred racer does to the cart-horse. Its small head, its very fine coat, its great length of limb and depth of chest, all bespeak the highest "breeding." I never saw any ordinary camel (or djimel) which approached within eighteen inches the stature of a mahari; but the most distinctive development is in the depth and width of chest, while the hump is comparatively small. The Saharans maintain the mahari to be distinct species; but it is not necessary to be an acceptor of Mr. Darwin's theory, in order to believe that this noble creature is simply the development of the camel by a long course of artificial selection in a very dry, hot climate, where speed, and not the power of bearing burdens, is the one object aimed at. The Touareg is as careful in the selection of his breeding mahari as the Arab is in that of his horse. All intermixture with the common camel is carefully avoided; and as the pedigrees are handed down, many a dromedary can boast a genealogy far longer than the descendants of the Darley Arabian. The training of these white dromedaries, as the French term them, is among the "noble mysteries" of the desert; and certainly the mahari, so far as my own observation goes, is rendered obedient to the word of command, and lies down, turns, rises, quickens or slackens its pace, as no other camel is taught, at the voice of its rider. It is also guided by a bridle,—a single thong of leather attached to a ring inserted in its nostril when very young, and by which its rider directs it, dexterously flinging the rein over its head, and drawing it to either side at pleasure, a mode of guidance never adopted with the ordinary camel. But the most singular part of the dromedary's equipment is the saddle, placed, not on the hump or back, but on the neck and shoulders. It is prevented from slipping from its position by two girths; one just behind the fore legs, the other round the neck. The saddle itself is in shape like a chair, a wooden frame with a high back, covered with leather, and a curious high peak in front, narrow at the base, round which the rider crosses his legs, with a wide and flat top, on which he can lean his body and round which his pouches are slung. To an inexperienced rider, no motion can be more trying than that of the dromedary saddle. The only relief to be obtained from the uneven movement of the creature's shoulders, as it trots, is by resting the body against the peak; and, unless it be lifted at each step, a violent blow on the chest or stomach is the inevitable consequence. The ordinary pace of the mahari is a swinging trot; and this it will keep up from sunset to sunrise, without intermission, accomplishing with ease eighty miles in a day. Fabulous tales are recounted of dromedaries which have run 250 miles without a halt, and repeated the same distance the following day; but the endurance of even a Touareg could scarcely have sat out such a stage. To protect themselves from the exhaustion of the motion, the Touareg, before mounting, tie a very thick and tight bandage of leather round the stomach and loins. The mahari is fed principally upon dates instead of barley, which can rarely be procured in the desert, and, with a small supply of this fruit, added to the dry coarse herbs of the country, will undergo the severest fatigues.—'*The Great Sahara,' by H. B. Tristram*, p. 537.

Ornithological Notes from Shetland. By Henry L. Saxby, M.D.

Fieldfares and Redwings.—Not satisfied with having, as usual, "come in like a lion," March is going out like a bear. Yet, notwithstanding the prevalence of frost, snow and heavy winds, during the last few weeks, some of our regular spring visitors have already arrived. On the 2nd a steady breeze from S.W. brought a large flock of fieldfares; they remained until the 11th, when they left with nearly a gale from W.S.W. These birds, like the redwings, are not by any means common with us, and both species seem partial to travelling by night.

Oystercatchers.—On the 18th of March, came the oystercatchers, as usual punctual almost to a day. Oddly enough this species is only a summer visitor to Shetland, although it remains in Orkney throughout the whole year; the distance between the two groups of islands being considerably less than a hundred miles, it is scarcely probable that this migration can be entirely due to the influence of climate. It is not very often that birds are observed in the act of arriving from their winter quarters, but I am quite convinced that I have upon several occasions seen oystercatchers making their first appearance in the spring. Not one is to be found in winter, but shortly after the middle of March their loud echoing cry is sure to be heard—not a very musical one, it is true, although at the close of a long and dreary winter it is welcome as the voice of a long lost friend. They mostly arrive soon after mid-day, not in large flocks, but in small parties of half a dozen, or even less, keeping rather low, and making straight for their old haunts: there, if not much disturbed, they remain in a state of comparative inactivity for a day or two, displaying but little of their customary eagerness in their search for food, and often permitting a very near approach.

Lesser Blackbacked Gull.—Another of our summer visitors, but one which is not expected within the next few weeks, is the lesser blackbacked gull, which, although it breeds here in countless numbers, entirely deserts us soon after the young birds are strong upon the wing. This species also remains in Orkney throughout the year.

Lapwings.—Some thirty years ago lapwings were very uncommon in Unst, and also, I believe, in most other parts of Shetland. Now, however, there are whole colonies of them in various parts. They left as usual, in autumn, but the first flock returned to Baltasound on the 21st of March.

Wild Swans.—On the same day (March 21st) the first hoopers were seen, and they will probably continue to arrive at intervals until about the middle of April. As a rule, the flocks which come at this season are much smaller than those which pass southwards in autumn, but nevertheless, in April, 1858, I saw as many as fifty-two fly over this house. I have observed that on their return they often fly nearer to the ground, sometimes within easy stone's throw. This is most likely, because in spring the greater number arrive late in the evening, or very early in the morning, when there is but little stirring below, whereas in autumn they most frequently pass over in broad daylight, when the people are gathering in their harvest. This difference as to time seems to imply a certain definite range in their migrations. During their flight they utter a soft and rather melancholy cry, resembling the words "Who, who, who," repeated many times in succession: on a calm spring evening about twilight, or, as the Shetlanders say, "in the dim," these sounds have a strange, one might almost say solemn, effect. The flight is performed with great swiftness, although, to all appearance, rather laboriously; indeed the poor birds seem to be always ready to remain for a night upon the lochs, or sometimes upon the quiet sheltered voes. Strange stories are often told of the supposed perfect order of their flight, and of the regular system of relief which is said to be observed among the leaders. My own experience is small, but, as far as I have been able to ascertain, the flock really does occasionally assume the precise form of a wedge, but far more frequently it has the appearance of a long irregular line. I never saw any other than a white, and therefore adult, bird taking the lead. Every now and then, sometimes twice or thrice in a minute, another passes to the front and becomes the leader, but this seems to be more a matter of fancy than of obedience to any fixed plan.

Snow Buntings.—It would be difficult to imagine a scene more suggestive of famine and desolation than that presented by the hills above the Loch of Watley after a heavy fall of snow; nevertheless, when I had occasion to cross them one day early in the month, there, true to their name, were the hardy little snow buntings flitting from stone to stone, and twittering as merrily as though they were in the midst of plenty. The hard weather which accompanied that same fall of snow was severely felt by birds of many kinds. Wild ducks, goldeneyes, tufted ducks and pochards, all left the inland water and appeared upon the voe: the previous snow had long since driven the golden plovers to seek their food upon the shore, below high-water mark.

Snipes.—Snipes, too, suffered considerably. On the 13th of March I saw about a dozen crowding round a small spring in front of the house. I know one well-authenticated instance in which seventeen out of a party thus assembled were killed at one shot. In Morris's 'Birds' an almost similar case is recorded. During a frost, snipe may constantly be found feeding in abundance along shore, and it is therefore difficult to account for the fact that at such a time individuals are to be met with in a half-starved condition a few hundred yards inland, when a visit to the shore would enable them amply to supply their wants. Thus it is that one person upon the shore may shoot snipe in excellent condition, while another, a little inland, may upon that very day meet with none that are worth powder and shot. In hard weather I have several times seen snipe close under the windows, tapping the frozen ground with their bills in the vain endeavour to find a soft spot where the snow has been swept away. One greatly excited my compassion by its miserable appearance, and I endeavoured to tempt it with some small strips carefully cut from the breast of a glaucous gull which I happened to be skinning at the time: these so much resembled earthworms that I confidently placed them in the bird's way, but, although it evidently perceived them, it never even attempted to take one in its bill. I have since asked myself whether a snipe ever does take food from a hard surface. A hooded crow, which afterwards appeared upon the scene, was not so particular. Very early one terrible morning in winter I found a dead snipe upon the ledge outside the kitchen-window: the poor bird was crouched up almost into the form of a ball, and was in such sad condition that when I took it up it seemed to weigh little more than a stuffed skin.

Sky Larks.—Upon the 3rd of March the song of the sky lark commenced, and it has since regularly accompanied almost every gleam of sunshine. Very few of these birds remain during the winter.

Gulls.—Iceland and glaucous gulls have left, but they are very irregular in their migrations: I have seen the former in May, and the latter even as late as June. Iceland gulls are comparatively rare, but a severe winter is sure to bring large numbers of glaucous gulls to feed upon the dead ponies. I have only seen one ivory gull this winter.

Ravens.—Ravens are very busy with their nests in the high sea-cliffs, and will soon begin to lay. In Shetland I have never seen the eggs earlier than the 22nd of March. Ravens arrive in great numbers about the middle of October, and remain until the commencement of the breeding season. As many as forty may sometimes be seen together upon the hill-side, but they are then very shy and difficult to approach. Very little damage is done by them at this time of the year, but a few weeks hence, when the young birds begin to require a large supply of food, the parents are sure to visit the farms and commit serious depredations: no uncovered egg will then be safe, and ducks, hens, lambs and foals, will be mercilessly slaughtered. Even full-grown ponies will not be secure if they exhibit any signs of weakness. The first attack is always made upon one eye, and then, as the tortured animal endeavours to alleviate the agony by rubbing the wound upon the ground, the other eye is pierced, and the cruel bird flies off, only to return when its victim is dead. A pony struggling to extricate itself from a peat bog is almost certain to be destroyed by ravens if it remains long unaided.

Blackbirds, Redwings, Bramblings and Chaffinches.—Before Dr. Edmondston began to plant shrubs about his house, many insessorial birds which now visit us regularly were almost unknown in this island. We now look with confidence for the blackbird, the redwing, the brambling and the chaffinch. The latter is the most regular in its visits, as well as the most numerous, but neither of the four species just mentioned remain to breed: several chaffinches, both male and female, have been here all the winter.

Yellowhammer and Robin.—To-day (31st of March) a great rarity appeared in the shape of a yellowhammer, and some weeks ago a still greater rarity honoured us with a visit—it was nothing less than a robin redbreast! When a Shetlander talks of the robin he almost invariably means the wren, a bird which is almost common in some parts of these islands.

Carrion Crows.—A few carrion crows have lately arrived; it is very long since I last saw one.

Whitetailed and Golden Eagles.—On the 14th of March, word was sent to me that whitetailed eagles were returning to a nest in the island of Yell, where they have been in the habit of breeding for many years. I know an eyrie in Fetlar, and a few others in various parts. About ten years ago I saw a nest at Lund, in this island, but it is now deserted. A pair of these birds now breed undisturbed in the high-cliffs at Noss, the only man who was able to climb to the nest having been killed in his last attempt to reach it. Golden eagles are still said to breed in Foula, but there is reason to doubt the report.

Upon the voes there are still plenty of cormorants, shags, great northern divers, black guillemots and many of the commoner species of gull. There are also a few scaups and longtailed ducks, and some flocks of redbreasted mergansers. One of the latter, shot a few days ago, had a very peculiar appearance, in consequence of the iris being of two distinct colours, an outer ring of crimson and an inner one of reddish brown. Upon the shore the most remarkable birds are purple sandpipers and a few redshanks. Greenshanks occasionally occur, but none have been seen this winter. Flocks of ringed plovers are breaking up, and many of the birds are already returning to their breeding-grounds. Rock pipits are abundant everywhere along the coast: their song commenced on the 29th of March.

Water Rails.—During the winter, water rails were to be seen in many parts of these islands. Upon the whole they may be considered rather scarce here, but they have been more frequently met with this year than previously. As soon as the frost sets in they visit enclosed grounds, sometimes venturing into corn yards, and even to our very doors; but I never found corn in their stomachs, even in the most severe weather. One couple invariably takes possession of an angle of a rough wall near a small spring, and where a thick row of willows affords them some concealment even in winter. A few others are to be seen in the garden, where it is probable they will soon become acquainted with cats and merlins, which seem to be especially fond of preying upon such poor wanderers as seek shelter therein. How the two just mentioned manage to escape is a mystery, but I fancy they display even more than usual caution. Sometimes I have crept behind the wall and watched them through the crevices; but no matter how cautiously I approach, they always hear me, and are never in sight when I take my first peep. After awhile, however, one slowly glides from among the tangled herbage at the foot of the hedge which skirts the wall, stands to listen, and then, if satisfied, walks rapidly about the grass, nodding with every step, and constantly picking at something upon the ground; occasionally it catches sight of some article of food several feet distant, and runs headlong to seize it. When I raise myself so as to see above the wall, although there is a pretty fair screen of twigs above, I am instantly perceived, and the watchful bird stands for some seconds with its neck at full stretch and its tail elevated; then, as if convinced that the apparition is not to be trusted, it makes off for shelter with all speed. The bird which, from its smaller and more slender make, and also from its more subdued colouring, appears to be the female, is much the more shy of the two, never coming out until some minutes after its companion. Once when both were out, and within a fathom of me, I tried the effect of suddenly rising to my feet. Instantly the astonished birds scampered off to shelter, and in an almost incredibly short space of time one darted through a chink on my side of the wall. It stopped abruptly on perceiving me, and then, instead of retreating, took wing, and with heavy flight dropped towards the mouth of a drain about forty yards distant, and in the twinkling of an eye was out of sight.

HENRY L. SAXBY.

Baltasound, Shetland, March 31, 1864.

Some Particulars of Birds obtained in the Neighbourhood of Eastbourne, Sussex.

By JOHN DUTTON, Esq.

THIS rich and beautiful region is as celebrated for objects of Natural History as it is for the salubrity of its climate, its noble cliffs and breezy downs, which teem with the feathered race. That magnificent headland Beachy Head, 588 feet high, the crest of which is visible far out at sea when the last expiring beams of day linger on its summit, tinting it with a rosy hue when the sun has sunk to rest below the horizon. How many a wistful eye has looked upon it from the deck of the "outward bound,"—

> "When slow the ship her foaming track
>   Against the wind was cleaving,
> Her fluttering pendant looking back
>   To that dear land 't was leaving."

The young cadet, who has just torn himself from the embrace of his widowed mother, has gazed upon it with a full heart as it gradually faded away in the gray of evening; and then when returning home, after a lapse of twenty or thirty eventful years, the master of wealth and honours, the well-remembered outline of the cliff has met his eyes in bold relief against the brightening sky at sunrise,—

> "While homeward bound with fav'ring gale
>   The gallant ship up channel steered,
> And scudding under easy sail
>   The mighty headland first appeared."

That magnificent headland has seen the lordly eagle wing his way on more than one occasion, "on pinions that never flutter:" one occurred as recently as 1859.

This cliff, a few years since, was celebrated as the breeding-place of multitudes of the cliff-birds; but from a very extensive "land slip" that occurred some years since, it is no longer the great resort that it was at that time. However, a good many of the guillemots, razor bills and herring gulls breed there now. I will give a few of the birds, some of which breed here, and are either in my own collection or in that of others.

Whitetailed Eagle. One in my own collection was shot at Birling Gap, near the Lighthouse, on the 17th of December, 1859, by a coastguardsman. Captain Knox, in his charming 'Ornithological Rambles in Sussex,' also mentions one shot at Pevensey in 1851, which Mr. A. Vidler stuffed for Mr. Ellman, of Lewes.

Peregrine Falcon. A pair always breed near Beachy Head, and did so last year. On Monday, May 18th, 1863, I had a peregrine falcon brought me from a nest containing two others, taken on the previous Saturday, near the Lighthouse here.

Hobby. Several were killed here in 1861. It is a rare bird in this district.

Merlin. Occasionally met with near the cliffs.

Kestrel. The common hovering hawk that is so frequently seen about. It breeds in numbers on the cliffs.

Buzzard. One was shot at Ampton Place, the (then) seat of the Duke of Devonshire, in 1859, which I saw.

Honey Buzzard. A very fine one was shot on the 18th of September, 1862, by Mr. Gorringe, jun., of Birling Farm, on an apple tree in his garden, and which I preserved for him.

Marsh Harrier. Occasionally on the downs and marshes. A magnificent one was in the collection of Mr. A. Vidler, a year or two since, shot by him in 1858.

Hen Harrier. A fine female in my collection. Another shot last spring, which I saw.

Montagu's Harrier. One in Mr. Vidler's collection, shot here a few years since.

Longeared Owl. Not infrequent. One shot at the cemetery here a month or two since. I have seen several.

Shorteared Owl. Constantly to be met with on the preserved rabbit-grounds and marshes during the woodcock season.

Barn Owl. I should say as frequent in Sussex as any place in England. I have had the adults, young and eggs, frequently offered me.

Great Gray Shrike. A very fine male in my collection, shot at Jevington on the 19th of November, 1861, by a farmer in the neighbourhood. Another was seen in company with it.

Redbacked Shrike. Common in hedgerows.

Pied Flycatcher. One was shot by Mr. A. Vidler at Pevensey, about two years since, which I have.

Pallas' Sand Grouse. One was killed by striking against the telegraph wires at Boxhill, in the fall of last year. A flock was seen in the road by Mr. Vidler on the day before.

Ring Ouzel. Great numbers come every year to our gorse-covered hills in the autumn. I have seen hundreds.

Black Redstart. A magnificent male was shot at Birling Gap by Mr. Gorringe, in December last. Another also I handled, caught by a birdcatcher.

Wheatear. I have made a great many inquiries about the wheatears coming, as they used to do, to these our celebrated Sussex downs; but alas! what a falling off is there. A shepherd told me that about forty years ago as many as eighty dozen were taken, with one set of traps, in one day. Alas! this is not the case now. The shepherds speak of their becoming less numerous every year. Where there were hundreds of dozens taken formerly, there are only a few dozens taken now. They are chiefly taken in snares of a very simple description. They breed in the cliffs, &c. For several years one has built at Pevensey in an old six-pounder cannon.

Dartford Warbler. Scarcely ever have I been out for a day's rabbit shooting on our preserved furze-land without seeing one or more. They are not at all uncommon here. They must breed here. There is no mistaking him with his long tail, so much like the long-tailed tit.

Rock Pipit. Common on our cliffs. Breeds.

Wood Lark. Numbers were here in the severe winter of 1859—60, associating with the sky larks. I have several of them.

Snow Bunting. A few occur most winters, but mostly when there is plenty of snow. A splendid one in my collection.

Brambling. Vast numbers occurred in the severe winter of 1859—60. Several in my own collection.

Tree Sparrow. Several were shot at the cemetery this spring, and brought to me. They occur every winter.

Hawfinch. Most winters. One was killed by striking against the Lighthouse a short time since, which I have.

Chough. An old shepherd says, "Them there redlegged crows was common at Beachy Head and 'Bell Tout' (the name of the Lighthouse) about forty years ago." They are now extinct.

Raven. A pair always build in the cliffs between Beachy Head and the Lighthouse. I have the young brought me most years. They generally fly down on the beach and are caught.

Hooded Crow. Very abundant on our marshes and sea-shore from October till April.

Hoopoe. Must have been very common a few years since, as in many of the old houses and inns you see them stuffed; very few, however, have occurred lately.

Nightjar. Very common at its proper season.

Rock Dove. Large flocks sometimes occur.

Redlegged Partridge. . Supposed to breed here. Often shot.

Quail. Not uncommon. Breeds occasionally. Two in my own collection shot here.

Stone Curlew. One in my collection. Breeds occasionally on the hills and fallows.

Golden Plover. Large flocks appear in the winter.

Dotterell. Occasionally. Supposed to breed.

Ringed Plover. Very common. Breeds.

Turnstone. Occasionally, Cuckmere Haven.

Oystercatcher. Not uncommon.

Crane. One was shot in a chalk-pit at Westham, about ten years since. It was purchased for the collection of Mr. Ellman, of Lewes, for £5. It formerly belonged to a neighbour of mine.

Heron. Very common in the marshes.

Bittern. Almost every winter. Three were shot here during last winter, two of which I saw.

Spoonbill. Occasionally. An immature one was shot at Pevensey about two months since.

Whimbrel. Common in April and May.

Redshank. Spring and autumn. Cuckmere Haven.

Spotted Redshank. Pevensey. (Mr. Vidler's collection).

Greenshank. Autumn. Cuckmere Haven. I have seen seven or eight in a day there. Several in my collection.

Avocet. One in Mr. Vidler's collection, obtained at Pevensey a few years ago.

Blacktailed Godwit. Cuckmere Haven and Pevensey. Rare.

Bartailed Godwit. Pevensey and Cuckmere Haven. Several in my collection.

Curlew Sandpiper. Not uncommon at Cuckmere Haven in the autumn.

Little Stint. Several in my collection. A man once brought five or six for sale, which he had shot at Cuckmere Haven.

Temminck's Stint. Cuckmere Haven. My brother shot one there about two years since.

Spotted Crake. One in my collection shot at Pevensey. Not infrequent in Pevensey Marshes. Mr. Vidler has shot numbers.

Little Crake. One was caught alive at Gravitt's Pond in March, 1862. It is in my house at present, and belongs to a Mr. Bates here.

Whitefronted Goose. In Mr. Vidler's collection: shot by him at Pevensey.

Bernicle Goose. In Mr. Vidler's collection: shot by him at Pevensey.

Brent Goose. Frequent in the winter, or in the spring on their return from the mud-flats of Hampshire.

Egyptian Goose. A very fine specimen of this rare goose was shot on the 4th of December, 1862, by a farmer residing at Watling Hill, and purchased by me for my collection. It is in perfect plumage, and appears never to have been in captivity; and what tends to confirm me in this opinion is the presence of an old and perfectly healed gun-shot wound in the foot, and the unsoiled state of its plumage.

Hooper. Occasionally in severe winters. One, shot at Pevensey, in the collection of Mr. G. A. Jeffrey, of this place.

Pintail Duck. Occasionally in the winter. A beautiful couple, male and female, were shot by Mr. J. Austen, of this place, at the Crumbles, on the 27th of February, 1864.

Garganey. Occasionally in hard winters. Some in Mr. Vidler's collection.

Velvet Scoter. A very fine specimen in my collection, taken alive on the 14th of April, 1863.

Common Scoter ("Black Duck"). Perhaps as common as anywhere in England. Very shy.

Longtailed Duck. A splendid female was killed by a stone on a pond near Polegate, on the 27th of February, 1864. I examined it in the flesh.

Scaup Duck. Very common in the winter. I saw a great many last winter.

Tufted Duck. One in my collection, obtained here.

Goldeneye. Several in Mr. Vidler's collection. Very much rarer than formerly.

Smew. An immature specimen in my collection, shot here.

Sclavonian Grebe. In Mr. Vidler's collection.

Redthroated Diver. Exceedingly common. Hundreds may be seen "off at sea" during the sprat season.

Guillemot. Exceedingly common in the Channel during April and May. Shooting them is quite as much a business as puffin-shooting at Freshwater, Isle of Wight. I went out on the sea with my brother on the 20th of April last, and we killed twenty-three. A few breed at Beachy Head.

Ringed Guillemot. I shot one off Beachy Head about two years since. A fine specimen was brought me on the 18th of April last, shot on the same day.

Razorbill. Rather common. Breeds.

Gannet. A few are always to be met with during our herring and sprat seasons. I counted about twenty off Beachy Head in October, 1862. One in my collection, shot by a fisherman.

Arctic Tern. Notwithstanding that such eminent authorities as Mr. Gould, Mr. Edward Newman, Mr. H. Stevenson and others think differently, I still am of opinion that the tern that breeds on our

"Crumbles" is the arctic tern, and not the common. I have collected a great many of the eggs, and find, by comparison with those in the British Museum, that the "arctic tern" is here the "common tern." Captain Knox, in his 'Ornithological Rambles in Sussex,' says:—"The arctic tern is decidedly more numerous on Pevensey Shingle, during May and June, than the common tern. In fact this bird is here (Eastbourne) the 'common tern,' and would appear to be more generally distributed throughout the British Islands than any of its congeners." Such also is my opinion.

Lesser Tern. Not infrequent in Pevensey Bay during the summer and autumn. I do not think it breeds on the "Crumbles."

Little Gull. A perfect beauty was shot here on the 6th of December, 1860. It was purchased by Mr. Pratt, of Brighton.

Ross's Roseate Gull. One was shot by Mr. Albert Vidler, of Pevensey, in 1852. It was purchased by Mr. J. B. Ellman, of Lewes. I believe only two specimens have occurred in England.

Kittiwake. Exceedingly common in the winter. During the sprat season you may shoot any quantity. I shot, last December, twenty in an hour from one of the sprat-boats.

Common Gull ("Winter Gull.") Large flocks are constantly to be seen, during the winter months, on our downs and fallows, searching for worms, &c. I have seen hundreds this winter. I do not say they are all common gulls.

Lesser Blackbacked Gull. A few breed at Beachy Head and Newhaven. I have frequently seen them when off shooting at sea.

Herring Gull. Numbers breed between Beachy Head and "Bell Tout" Lighthouse.

Great Blackbacked Gull. Provincial "Parson Gull." I have seen upwards of a hundred at one time on the sands off Beachy Head during the winter months. Common here.

Pomarine Skua. Perhaps more common than supposed to be, from its resemblance to a young herring gull. Two in my collection. One shot by me in October, 1862, off Beachy Head.

Richardson's Skua. One in my collection, a splendid adult, shot on the 6th of June, 1860, at Langney Fort, by a man named Ward.

Manx Shearwater. One was shot about two years since off Beachy Head, which came into my possession.

Forktailed Petrel. One in Mr. Vidler's collection at Pevensey.

Storm Petrel. Not very uncommon. John Ward shot three specimens "off at sea" on the 18th of June, 1860, which I saw and handled. They were purchased by Mr. Vidler. There were several more seen at the same time.

JOHN DUTTON.

Norfolk Ornithology.—I am quite sure that when you inserted in last month's 'Zoologist' (Zool. 9025) a reprint of my paper on the Ornithology of Norfolk, from the new edition of White's Gazetteer for this county, you had no intention of doing anything which would place me in a false position; but the fact of the appearance of that paper, slightly altered in style of arrangement, and with my name attached, would naturally lead to the impression that I had forwarded it myself as a communication to the 'Zoologist.' It is this impression that I am particularly desirous of correcting, inasmuch as the work for which this paper was written by request is not yet published, and Mr. White would have had a very fair ground of complaint against me had I forestalled that portion of his publication, by contributing it entire to another journal. Mr. White very kindly supplied me with copies of my paper for private distribution as soon as that part of the Gazetteer had passed through the press, and one of these I forwarded to you, knowing your interest in such local "lists,' and thinking you might be inclined to notice the fact of its publication by way of review. You will, I am sure, readily give insertion to this explanation, which is, I think, desirable under the circumstances, both as regards Mr. White and myself.—*H. Stevenson.*

[I regret this mistake, but I am so much in the habit of regarding all communications sent to the 'Zoologist' as intended for publication, that I arranged Mr. Stevenson's for press as a matter of course. Mr. Stevenson neither requested publication nor accompanied the paper by a veto.—*Edward Newman.*]

Rare appearance and scarcity of the Kite and other Birds.—In answer to Mr. Fox's remarks on the scarcity of the kite (Zool. 9039), it is to be hoped that the bird seen by him on the way to be stuffed was not the last of the species in Wiltshire. Many years ago, when on a long visit to a relation who lived within a very few miles of Whittlebury Forest, Northamptonshire, my eyes were very frequently gratified by a view of this noble hawk sailing majestically through the air in beautiful circles, without seeming to move a feather for minutes together, and now and then dropping gently down to the earth on his prey, a mouse or small bird frequently. The kite is the bird named by Butler, in his 'Hudibras,' as the "verriest long-winged hawk that flies." No doubt the gun of the gamekeeper and the rat-trap, judiciously covered with earth or weeds and baited with a mouse or a bird in open fields, are the causes why we now seldom see the kite in all game-preserving countries; but I regret his disappearance, as he is a much more harmless enemy to game of all sorts than many of his congeners not half his size. With respect to the scarcity of other birds, there are many causes, which have lately been mentioned in the 'Zoologist,' to account for it, such as the increase of population, the clever manner in which the birdcatchers entrap most of the singing birds of all sorts, the great mania for the collection of birds' eggs, and, last though not least, the increased number of juvenile sportsmen with pistols and fowling-pieces (many boys take excellent aim with the catapult and destroy an immense number of birds); in fact, the increased number of traps and engines for the purpose of killing birds and game of all sorts. The only bird which seems, in my knowledge, to have increased in number is the common house sparrow. That great bird, the bustard, or wild turkey, used to be plentiful in Norfolk; they were often run down by greyhounds; these birds are now only a matter of history in the East of England. From the same causes assigned to account for the scarcity of the kite, magpies and carrion crows are greatly reduced in numbers, both in England and Scotland.—*H. W. Newman; Hillside, Cheltenham.*

Montagu's Harrier at Eastbourne.—A fine female specimen of Montagu's harrier was trapped on Monday, April 15, 1861, at Pevensey Levels, and came into the possession of Mr. Albert Vidlow, of South Street, Eastbourne. It had already killed three young hares, and it was caught in a trap baited with one of them.—*John Dutton.*

Great Gray Shrike near Norwich.—Two specimens of the great gray shrike were seen in this neighbourhood on the 2nd of April last, one of which was caught in a trap-cage by a young man: it was kept alive till within a few days since, when it died.—*T. E. Gunn; Norwich, May* 6, 1864.

Redwing singing in England.—Since my former communication was written I have read the notes on the singing of the redwing published in the April number of the 'Zoologist' (Zool. 9021). Any communication from Mr. Bond is sure to meet with the respect which his well-known science as an ornithologist must always command; but in answer to his observations I beg to say that it was no twittering of the redwing to which I have many times listened with much pleasure, but a full and continued song, poured forth with open bill and largely-distended throat, and that in more than one instance the bird in the act of singing was within three or four yards of my head. Without pretending to compare my own experience or ornithological knowledge with that of Mr. Bond, to whose opinion in any doubtful matter I would most readily defer, I may venture to say that I am as fully competent to judge of the difference between a redwing and a song thrush as any naturalist can possibly be. It is not in garden shrubberies or in trees by the road-side that I should ever expect to hear the redwing sing; such places abound here, those in my own garden are unusually extensive, and redwings are not uncommon; but the deep solitude of the great woods in Oxfordshire, where much of my leisure time was formerly spent, offers a much more suitable locality; and I have no doubt that any one who would take the trouble of seeking them in their favourite haunts in such places, at a similar period of the year, and under the circumstances detailed in my former note, would be amply repaid by hearing the redwing in full song. My story is now told, its truth and accuracy in every particular I most positively affirm, and I think I know enough of Mr. Bond to feel sure that he at least will believe that I have heard the redwing, not twittering, but in full song. If Colonel Newman will refer to my first note (Zool. 8946) he will see that I did not speak of any resemblance between the song of the redwing and that of the nightingale, I merely compared them on the score of excellence; but that, as he expected, I did point out its general similarity to the song of the thrush, asserting the superiority of the former in richness of tone. The observations of Mr. Cooper tend in the main to corroborate my own statement. I will now only add that I do not intend to allude again to this subject, unless specially invited to do so.—*A. Matthews; April* 2, 1864.

[Received in ample time for insertion in the May number, but after the pages touching the redwing were printed, and it would have occasioned inconvenience to the reader had I placed it elsewhere. I see no occasion to alter my last editorial note on the subject: it is perfectly evident that all the interlocutors seek to establish the truth, indeed I never can believe any true naturalist could entertain for a single moment any other design.—*Edward Newman.*]

CONTENTS.

INSECTS.—Notes on the Economy of certain Micro-Lepidoptera, *Charles Healy*, 9065. Life-Histories of Sawflies, Translated from the Dutch of M. Snellen van Vollenhoven, *J. W. May*, 9067. On the Sagacity exhibited by certain Bees and Ants, *Frederick Smith*, 9073. New Locality for Claviger foveolatus, *G. F. Mathews*, 9077. Beetles in a Boat-house, *E. M. Geldart*, 9077. Scent of Cicindela campestris, *William Ingall*, 9077.

PROCEEDINGS OF SOCIETIES.—Entomological Society, 9078.

SUCKLERS.—Monkeys in Africa, 9090. Harp Seal in Shetland, *Henry L. Saxby, M.D.*, 9090. The Grampus in the River Parret, Somersetshire, *Thomas Clark*, 9090. The White Camel of the Sahara, 9090.

BIRDS.—Ornithological Notes from Shetland, *Henry L. Saxby, M.D.*, 9091. Some Particulars of Birds obtained in the Neighbourhood of Eastbourne, Sussex, *John Dutton*, 9096. Norfolk Ornithology, *H. Stevenson*, 9103. Rare Appearance and Scarcity of the Kite and other Birds, *Col. H. W. Newman*, 9103. Montagu's Harrier at Eastbourne, *John Dutton*, 9104. Great Gray Shrike near Norwich, *T. E. Gunn*, 9104. Redwing singing in England, *Rev. A. Matthews, M.A.*, 9104.

TO CORRESPONDENTS.

Papers with the following signatures are arranged for press:—

On BIRDS.—J. H. Gurney, N. F. Dobrée, R. Tyrer, Henry Reeks, George Norman, C. E. Stewart, J. E. Harting, H. Doubleday, W. R. H. Jordan, P. Crowley, J. A. Harvie Brown, Robert Mitford, H. Stevenson, E. Hearle Rodd, H. Harpur Crewe, C. Harvey Smith, C. J. Maurice, G. F. Mathews, Matthew Hutchinson, W. W Boulton, H. B. Tristram (extract), William Bennett, John Cordeaux, Alfred Newton (extracts), John Dutton, S. P. Saville, Thomas Brunton, T. E. Gunn.

On REPTILES.—On the Crocodile, H. W. Newman.

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'The Entomologist' may be said never to have expired; it merely merged in the 'Zoologist,' carrying over all its correspondents to that Journal. For many years the thirty-two pages to which the 'Zoologist' was limited, amply sufficed for recording all the observations made in this country on every branch of Zoology; but the Journal itself created the food on which it fed, and by the end of 1856 its publication had so enormously increased the number of observers, that the addition of eight pages of the smaller type became a matter of positive necessity: I have also resorted to double numbers; yet still the arrears have increased, so that I now find it utterly impossible to publish my own remarks on any branch of Natural History: indeed I am exactly in the predicament of that Eastern monarch who, having provided a banquet, could find no room at the table for himself, every seat being occupied by a guest, and so he was compelled to remain outside the door. But I must not allow the reader of this prospectus to suppose that I desire to fill 'The Entomologist' entirely with my own lucubrations: it will be just as open as the 'Zoologist' to all contributors, and every contributor will please to say in which Journal he wishes his communications to appear, and whether in one or both.

Eight numbers will be published during the present year, and Subscribers wishing to receive the work direct from the Printing Office will please send Forty-eight Penny Postage-stamps.

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